SWRHL-67r

STATUS OF THE BIOENVIRONMENTAL RESEARCH EXPERIMENTAL DAIRY HERD
JULY 1, 1966 through DECEMBER 31, 1968

by
Donald D. Smith
Radiological Research Program
Southwestern Radiological Health Laboratory

U. S. Department of Health, Education, and Welfare
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Bureau of Radiological Health

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ABSTRACT

This is a status report of the Experimental Dairy for the period July 1, 1966 through December 31, 1968. It lists changes and improvements made on the facilities; presents production and reproduction statistics; details cow and herd health problems and treatments; and summarizes ^{131}I experiments utilizing the dairy herd.

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INTRODUCTION

The United States Atomic Energy Commission (AEC) on July 1, 1963, awarded a contract to the Southwestern Radiological Health Laboratory (SWRHL), U. S. Public Health Service (USPHS), to study the transport of radioiodine from the environment to man by the air-forage-cow-milk-man system. To initiate this study Bioenvironmental Research (BER) was established within SWRHL to develop field and laboratory research protocols.

An experimental dairy farm was required in order to study the passage of radioiodine through the human food chain under field conditions. Criteria for the farm site were determined and in 1963 a site was selected in Area 15 of the Nevada Test Site (NTS), 110 miles north of SWRHL. The criteria are covered in a previous report (1).

The history and status of the herd and facilities for the period May 22, 1964, to July 1, 1966, was presented in SWRHL Report No. 55r (2). The animal husbandry methods, i.e., feeding methods, milking procedures, identification and record systems, experimental procedures, etc., are all covered in that report and will not be repeated. This report covers the period July 1, 1966, through December 31, 1968, and reports changes in the facilities or dairy practices and documents the milk production, reproduction, veterinary medicine, and experiments of this period.

FACILITIES AND EQUIPMENT

The basic facilities were described in SWRHL Report No. 55r. There have been minor modifications and additions to the facilities made since that report as shown in Figure 1.

The original floors of the milk room and milking parlor of the Area 15 facility were unsatisfactory as they had inadequate slope to the drains and were too smooth and slippery. In July of 1966, the floor drains were lowered five inches and the slope of the floor increased to approximately 1/2 inch per foot. The floors were then surfaced with an epoxy and silicone-sand mixture that is easy to clean and furnishes good traction for the cows.

In August of 1966, an asphalt parking apron was laid on the north side of the milking barn. A concrete pad was poured on the south side of the building to furnish a foundation for a grain storage building and to provide a hard surfaced entry way for the cows. These changes have helped decrease the amount of soil blown or tracked into the building.

Also in August of 1966, a 1,128-bushel capacity, circular steel grain storage building was erected on the concrete pad. It is used for storage of the grain concentrate, salt, mineral supplements, and other feed supplies.

The holding pen was enlarged by removing the loading chute and extending the fence several feet to the south. Two head holders were incorporated in the south fence. Drainage was improved by lowering the floor drains and pouring a new drainage basin in the holding pen.

Two acres, to the south of the complex, were fenced with an electrically charged single strand wire, providing a much larger exercise area for the

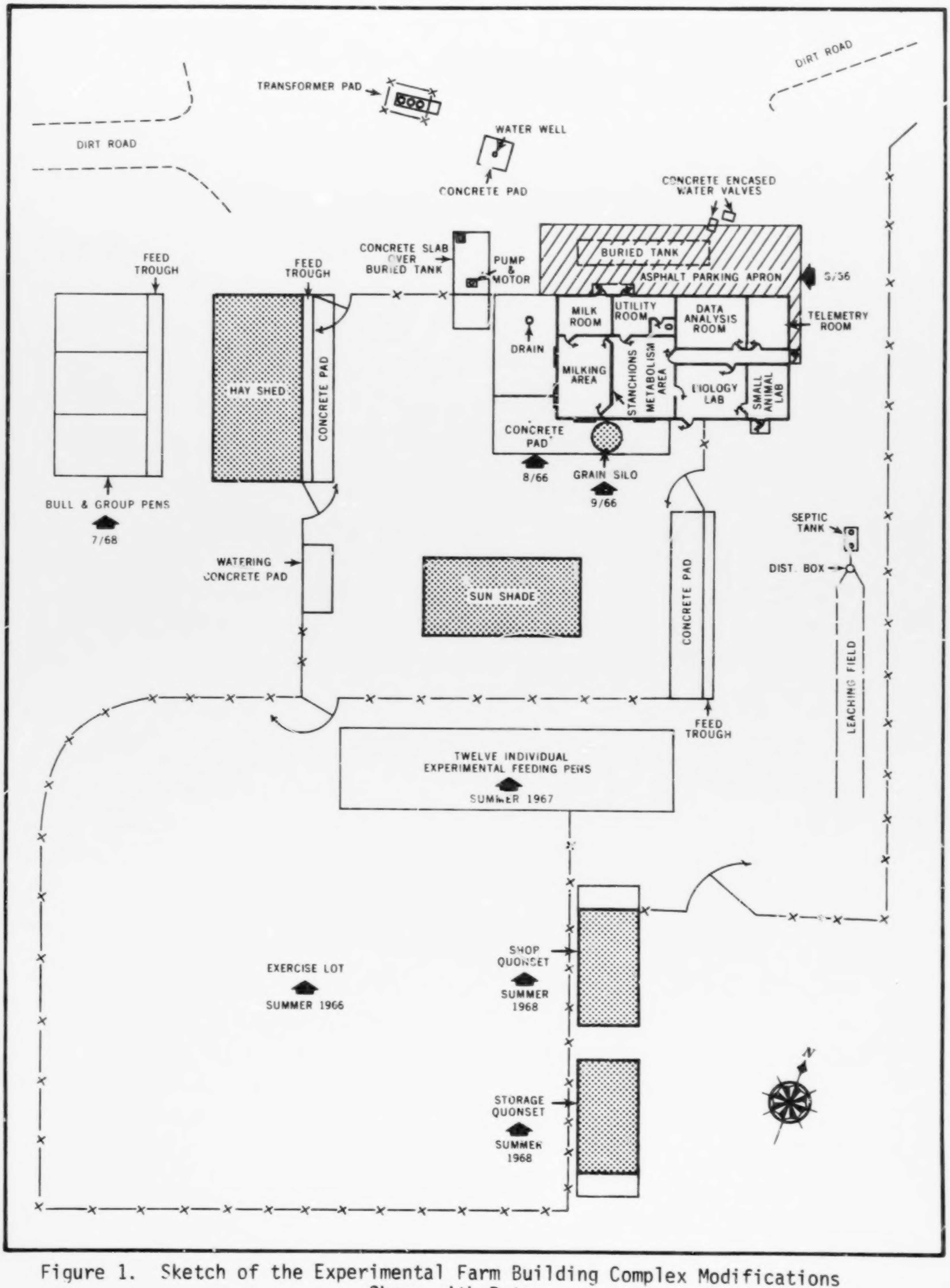
DIRT ROAD
TRANSFORMER PAD
WATER WELL
CONCRETE PAD
DIRT ROAD
CONCRETE ENCASED WATER VALVES
BURIED TANK
ASPHALT PARKING APRON
5/66
FEED TROUGH
FEED TROUGH
CONCRETE SLAB OVER BURIED TANK
PUMP & MOTOR
MILK ROOM
UTILITY ROOM
DATA ANALYSIS ROOM
TELEMETRY ROOM
DRAIN
MILKING AREA
STANCHIONS
METABOLISM AREA
BIOLOGY LAB
SMALL ANIMAL LAB
HAY SHED
CONCRETE PAD
CONCRETE PAD
8/66
GRAIN SILO
9/66
BULL & GROUP PENS
7/68
SEPTIC TANK
DIST. BOX
WATERING CONCRETE PAD
SUN SHADE
CONCRETE PAD
LEACHING FIELD
FEED TROUGH
TWELVE INDIVIDUAL EXPERIMENTAL FEEDING PENS
SUMMER 1967
SHOP QUONSET
SUMMER 1968
EXERCISE LOT
SUMMER 1966
STORAGE QUONSET
SUMMER 1968
N

Figure 1. Sketch of the Experimental Farm Building Complex Modifications Shown with Date

cows when they are not feeding. The extra area aids in keeping the cows cleaner and there are fewer foot problems as the exercise keeps the hooves worn short.

A concrete pad for 12 individual 9' X 9' experimental feeding pens was constructed during the summer of 1967. These pads provide drainage and are easily cleaned, however, some cows became lame after being maintained on them for several days. Most of the pens have since been surfaced with TarTan® which is manufactured by the Minnesota Mining and Manufacturing Company of St. Paul, Minnesota. No lameness has occurred on these new surfaces.

A mobile self-contained field milking barn and sampling laboratory was designed in 1967. This 30' X 8' X 10' semi-van trailer contains a two-cow milking parlor, a combination work and sampling room, a 550-gallon water storage tank and a utility room. The trailer is a single axle, drop frame model constructed of aluminum and steel which is riveted and welded into a semi-monocoque unit. The construction contract was awarded to the Aluminum Body Corporation of Montebello, California. The trailer was delivered in November of 1967.

With the growth of our farm facility, additional storage buildings were required to protect the machinery and equipment from the elements and to provide shop space for maintenance. Construction and installation of an adequate commercial building was estimated at $50,000 to $60,000. A survey of available surplus buildings was made and two 20' X 48' Quonset huts were located at Camp Desert Rock.

REECo, the NTS support contractor to the AEC, was consulted and an extensive plan for modification was devised which would cost $36,000. To conserve costs, the Farm Support Section (FSS) personnel surveyed, leveled, and packed two pads for the buildings. On April 25, 1968, the buildings were moved to the farm in "as is" condition at a cost of $2,448.60.

FSS personnel then developed their own plans for conversion and consulted with Area 12 maintenance. The cost of the modifications of the buildings was approximately $5,000. This price included new doors, lights, power panels, repair of walls and ceilings, and installation of a 4" X 20' X 50' cement pad for the shop Quonset. To keep the modification cost this low, FSS personnel built the steel frames and double 4' X 8' metal entrance doors, cut and graded the area for the concrete pad, and removed the existing plywood floor and backfilled it with three inches of gravel, trenched the ground for the electric cable, installed the water lines, and built and installed all partitions, work benches, and shelves in the shop area.

In July of 1968, three additional pens were constructed west of the hay shed. These were constructed of 6" X 6" posts, strung with cables under spring tension and are used to house the bull and to provide pens for experimental cows when they are handled as a group.

Power outages, both scheduled and accidental, frequently occur in this area. As the water supply and milking equipment depend upon electricity, personnel were often forced to haul water, delay milking, or milk by hand. To prevent this, a standby generator, with automatic controls, was installed during December of 1966.

All wooden fence posts, mangers, and feed bunks are sprayed with linseed oil annually. This prevents deterioration from the excessive dryness and heat of the summer.

FSS personnel provide normal preventive maintenance and repairs for the milking system. A factory representative conducts a complete survey annually to insure that the equipment is functioning properly.

ANIMAL HUSBANDRY

A. Background

As stated in SWRHL-55r, the original herd consisted of 17 grade Holstein cows purchased by the AEC in the spring of 1964. Eighteen registered Holstein cows were purchased from various sources during 1964 and 1965. Twelve animals were culled, sacrificed, transferred to other government agencies, or died so that the herd consisted of 12 registered and 11 grade animals as of June 30, 1966.

Since that time five additional registered cows have been purchased and six animals have entered the milking string via our breeding and replacement program. Eight animals have died or been transferred so as of December 31, 1968, the herd consisted of 10 grade and 16 registered Holstein cows (see Appendix I). Of the original 17 cows, 5 are still in the herd.

The lactating herd and the bull are maintained at the Area 15 Farm while the dry cows, replacement heifers, and newborn calves and nurse cow are maintained at the Well 3 facilities (2).

The record-keeping system, identification system, and routine and experimental milking procedures were detailed in SWRHL-55r and remain unchanged.

B. Nutrition

The cows, like most dairy cows in the Great Basin states, are maintained in a dry lot. They are not allowed to graze on pasture or the range. All roughage is brought to them. The basic roughage is alfalfa hay. This is supplemented with fresh green chop during the growing season of April through October.

Both the hay and green chop are fed free choice and are placed in the mangers twice a day. Consumption of hay is 35-40 pounds (16-18 kg) per cow per day, and that of green chop is 60-65 pounds (28-30 kg) per cow per day. All of the green chop (rye in April, May, and June and alfalfa for the rest of the growing season) is harvested from the Area 15 crop lands. Although these lands also produce over 60 ton of hay annually (3), additional hay is required. This is purchased under contract from various local vendors.

Samples of hay (both purchased and produced on the farm) are taken periodically. These are submitted to a commercial laboratory for analysis. (See Table 1 for selected nutritional ingredients.)

As the hay produced in desert areas is consistently high in protein, it was decided to feed 14 percent protein supplement rather than the 16 percent fed previously. The supplement is fed at each milking. Average consumption of this is 12 pounds (5.5 kg) per cow per day. However, the amount fed each cow is proportional to the level of milk production of the individual cow.

Trace mineralized salt is fed free choice to all the dairy cows. As this geographical area is extremely low in phosphorous and high in calcium, a special high phosphorous-low calcium mineral supplement is also given free choice.

C. Reproduction

The ideal reproductive cycle for a dairy cow is to produce a calf annually. She is bred from 50 to 70 days after calving, milked for 305 days and then rests for 60 days before calving. Our herd, like most commercial dairies, falls somewhat short of this ideal (see Appendix II).

Table 1. Selected Nutritional Components of Forages Fed to the Dairy Herd

Type & Source of Forage	% Protein	% Fiber	ppm stable Iodine	% Calcium	% Phosphorus	ppm Copper	ppm Molybdenum
1st cutting 1966 alfalfa hay purchased from Ence Bros - Jun 1966	17.39	27.40		.94	.16		
Alfalfa hay purchased from Ence Bros - Oct 1966	16.44	22.10		2.10	.24	4.3	Nil
Alfalfa green chop from Area 15 Farm Oct 1966	22.11	21.12		1.66	.26	21	7.9
Rye green chop from Area 15 Farm May 1957	16.77	21.08		.49	.31	17	4.3
Alfalfa green chop from Area 15 Farm Jun 1967	19.61	32.35		2.12	.29	21	8.8
Alfalfa hay purchased from Hunsaker Feed Co. Jun 1967	19.67	19.18	<1	1.59	.20	16	10.7

Table 1. Selected Nutritional Components of Forages Fed to the Dairy Herd cont'd

Type & Source of Forage	% Protein	% Fiber	ppm stable Iodine	% Calcium	% Phosphorus	ppm Copper	ppm Molybdenum
1st cutting 1967 alfalfa hay from Area 15 Farm	17.90	27.82	<1	1.56	.21	19	11.9
2nd cutting 1967 alfalfa hay from Area 15 Farm	21.22	23.22	<1	1.56	.31	21	15.0
Alfalfa hay from Area 15 Farm Sep 1967	20.02	29.58	4.5	2.21	.29	10	2.3
Alfalfa green chop from Area 15 Farm Sep 1967	19.87	30.83	<1	3.13	.32	11	1.3
Alfalfa hay purchased from Olaf Barhard Mar 1968	16.05	23.41	<2	2.32	.19	14	3.0
3rd cutting 1968 alfalfa hay from Area 15 Farm	15.15	23.77	1	1.13	.33	11	5.3
Alfalfa hay purchased from Olaf Barhard 1968	17.52	26.86	8	1.08	.25	16	4.3

A major deficiency in the breeding program is the delayed conception by cows after calving. During this reporting period, the average number of days open for each cow was 117 days. This extended open period probably results from failure to detect estrus (heat) as the average cow in the herd conceives after only 1.8 breedings. This problem is intensified during the summer months as the high temperatures seem to depress the sexual vigor of the cow. Also, many estrus periods occur during the evening hours when the cows are unattended so the heats are undetected. Heat will not be detected if it occurs during experimental periods when the cows are restrained in individual feeding pens.

In order to aid the detection of cows in heat, Kamar® [1] heat detectors are now placed on the rear quarters of eligible animals. When the cow enters into estrus she will stand for other cows to mount. The pressure from the brisket of the mounting animal turns the detector red. This color change requires three seconds of pressure and only an animal in estrus will allow herself to be mounted for this length of time. This system has aided tremendously in the detection of heats.

If a truly anestrus animal is found (no heats detected for 3-4 months) she is treated with 50,000 international units of Estrovarian® [2] which usually initiates a regular estrus cycle.

It is intended that replacement heifers will enter the herd from our breeding program. (See Appendix III.) In order to improve the quality of the herd, semen from superior bulls is selected from the semen bank of the Cache Valley Breeding Association, Logan, Utah. The cows are then bred by artificial insemination. A registered Holstein bull (No. 70) is also used on first calf heifers, on cows that have failed to settle after two breedings and when the insemination technician is not available. It is planned to train another herdsman so that a trained technician will be available seven days a week.

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[1] Kamar, Inc., Box 26, Steamboat Springs, Colorado 80477

[2] Warren-Teed Pharmaceuticals, Inc., 582 West Goodale Street, Columbus, Ohio

As of December 31, 1965, six heifers have entered the lactating herd through our breeding replacement program. Five of these have proven to be acceptable replacements.

Since July 1, 1966, there have been 68 calves born in the herd (see Appendix IV). Of these calves, ten were stillborn or died shortly after birth. Two of the stillborn calves were premature twins, two from cows that were affected with parturient paresis prior to parturition, and three (one set of twins) from cows that suffered from prolonged dystocia. The other three were born in the evening hours during inclement weather and probably succumbed because of exposure before aid could be rendered. There were six sets of twins during this period. All surviving calves have been large, vigorous, and have shown excellent growth.

There have been two abortions reported. The first occurred during the terminal stages of the life of Cow No. 5 who died from traumatic pericarditis. Cow No. 39 aborted in December 1968. No cause was determined as the fetus could not be found. However, she was negative for brucellosis and was apparently in good health and showed no clinical signs of illness or disease.

In January 1968, it was decided that male calves, freemartins (sterile female twin of a male), and crossbred calves were of no value to the program and were too costly to raise to an age where they could be transferred to another agency. Since that date, these calves have been euthanized within a day or two of birth. Euthanization is performed by the intravenous injection of sodium pentobarbital at the rate of 300 mg/10 pounds of body weight.

In 1968, Cow No. 35 became a nymphomaniac because of the formation of a large cyst on the left ovary. The cow was treated with 2500 units of chorionic gonadotrophin intravenously on several occasions and the cyst was manually ruptured. It is hoped that this regime of treatment will return her to a normal estrus cycle.

D. Production

Between July 1, 1966 and December 31, 1968, there were 58 complete lactations recorded. The average length of lactation was 272 days and 13,330 pounds of milk was the average production (see Appendix II). For the period of May 1964 to July 1, 1966, our average production was 12,385 pounds in 303 days. The average butterfat percentage was 3.4 percent for both periods with 439 pounds of butterfat per cow produced in the 1964-66 period and 449 pounds per cow produced in the 1966-68 period.

Although these statistics indicate that the herd production has continued to improve it is likely that the herd is near its maximum level of production. Despite an average age of 7.5 years, most of the cows are either under four years (four cows) or over eight years (seventeen cows) of age. Production is usually relatively low for both age groups as the period of maximum productivity is from 6-8 years of age. Also because of AEC regulations (see Appendix III), it is extremely difficult to dispose of inferior animals by placing them on the commercial market. As a result we are forced to keep animals that would be culled from the herd under commercial standards.

The Holstein-Friesian Association of America reports the following production figures based on a twice-a-day-milking, 305-day, mature-equivalent average of all reported DHIA records, 1956-1959.

Holsteins	Milk (lbs)	Butterfat (lbs)
Registered	12,560	460
Grade	11,567	424

The Washington County, Utah, Dairy Herd Improvement Report of November 1965 lists the following figures:

Number of Herds	8
Cows per Herd	84
Average lbs of Milk	12,241
Average % of Fat	3.5
Average lbs of Fat	433

It is apparent that the herd compares quite favorably to the milk production of other commercial dairy herds.

Our production is now fairly constant throughout the year as is shown in Figures 2 and 3. The average production (Figure 2) was 46.5 pounds of milk per cow per day. The total production per month averaged 25,370 pounds.

The butterfat content of the milk is directly affected by heredity, type of feed, sudden changes in diet and stage of lactation. The erratic results in the herd (Figure 4) are due, in part, to a large percentage of animals being on field test and on different types of feed; e.g., green chop and hay, green chop only, or hay only. However, the fluctuations in the herd butterfat values are not consistant from year to year when similar feeding and weather conditions prevail so other factors must be involved. Some of these factors may be delays in analysis or variations in the methodology used in performing the tests. Milk samples are collected from each cow on the 29th of the month and are delivered to the Virgin Valley Dairy Herd Improvement Association fieldman on the 1st of the next month. The same fieldman performed the test for the last four years. The DHIA-recommended preservative, potassium dichromate, is added to the sample at time of collection.

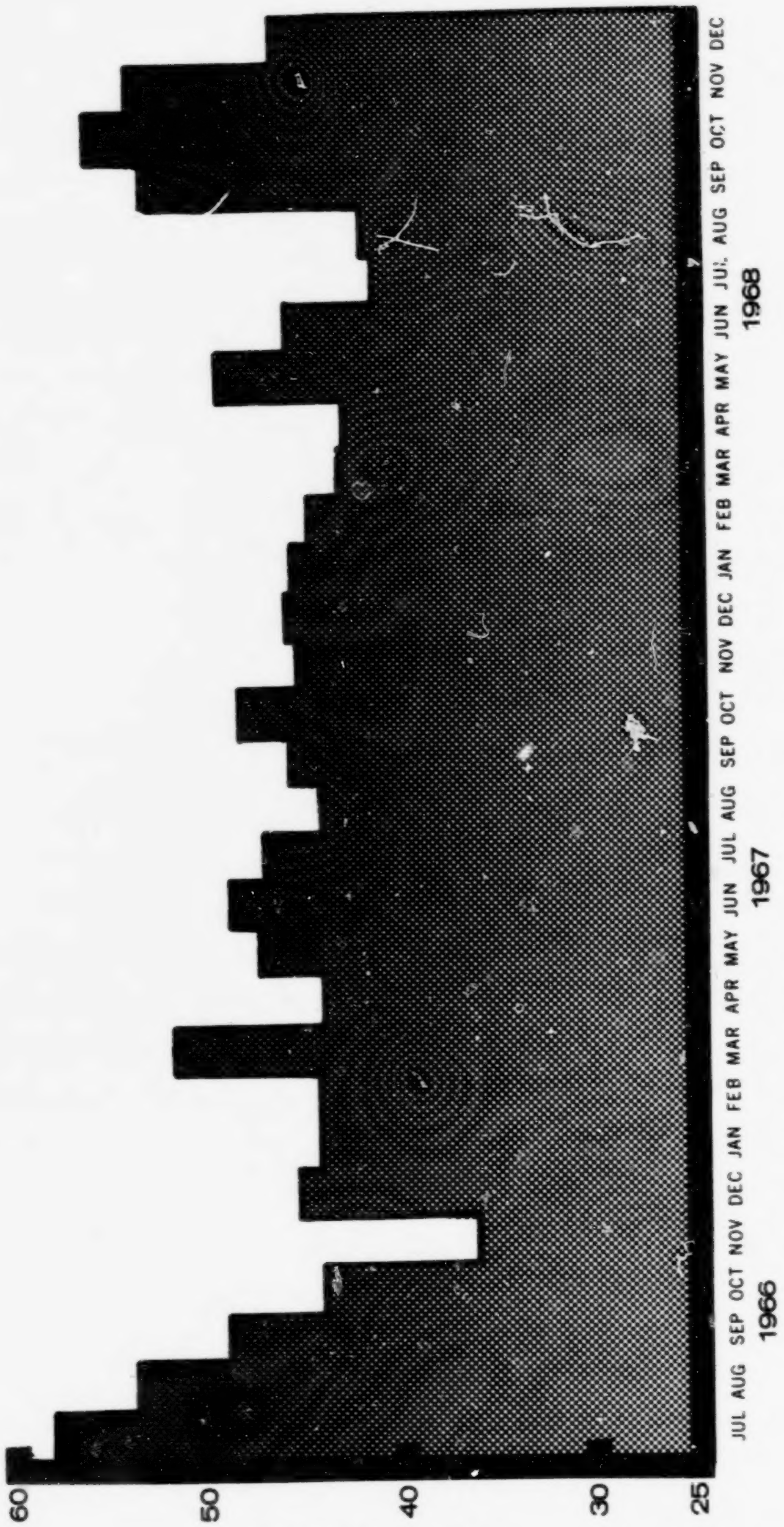

Figure 2. Average Daily Milk Production (per cow, per month)

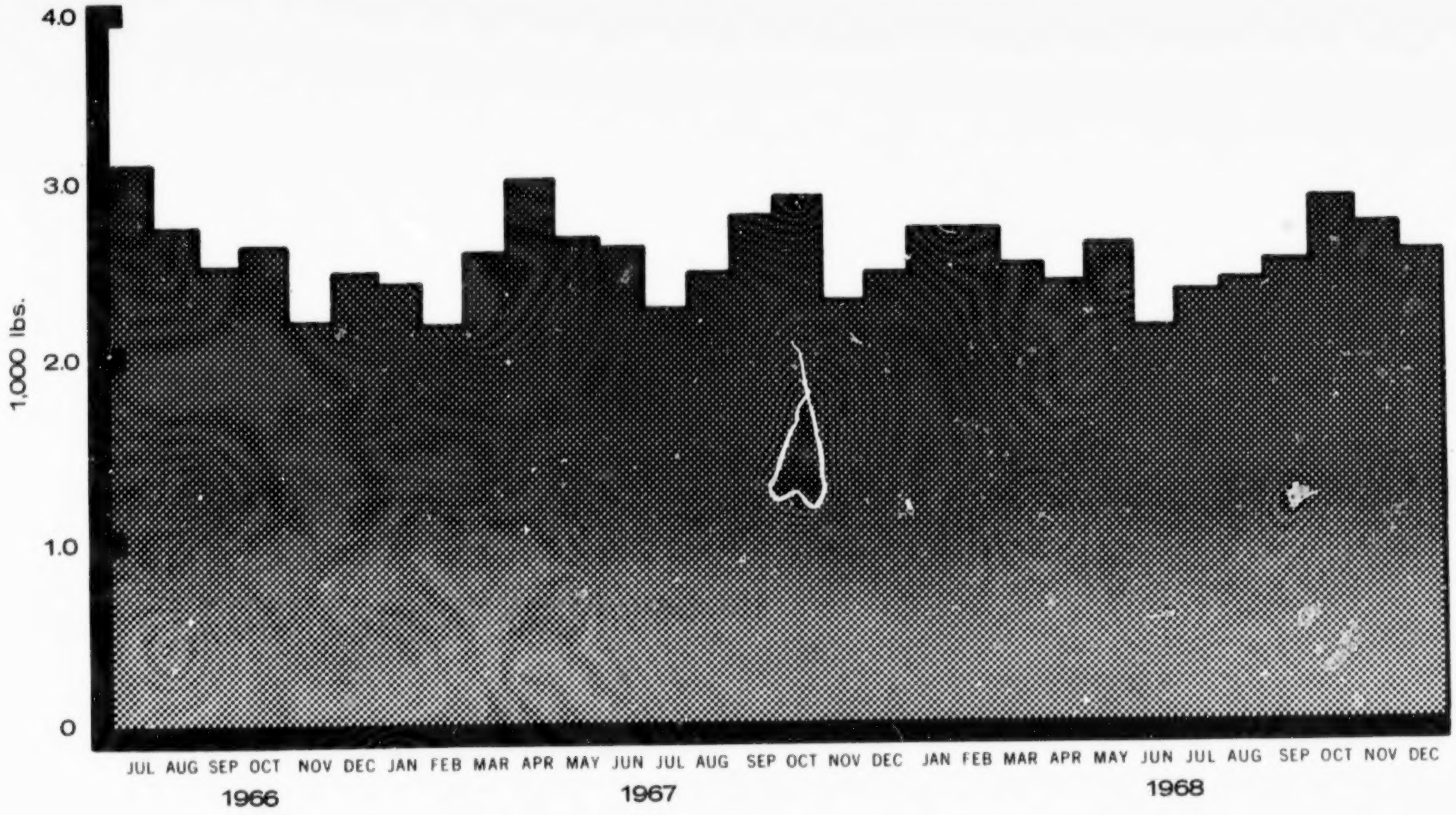

Figure 3. Monthly Milk Production of Herd

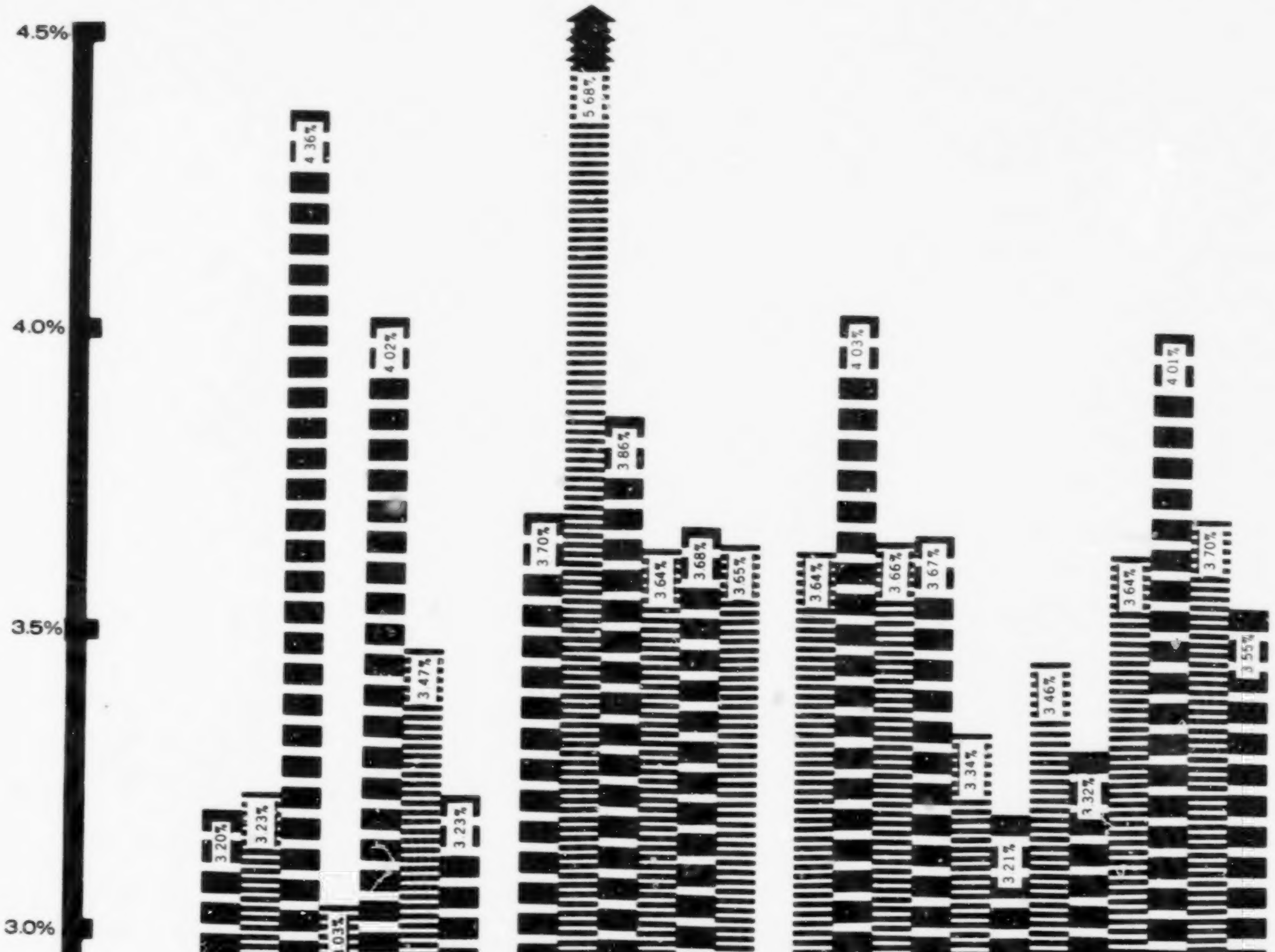

Figure 4. Monthly Average Butterfat Percentage of Herd

VETERINARY MEDICINE

As is true of most dairy herds, the most important health problems are concerned with breeding difficulties (discussed in the reproduction section, pages 7-12), calving complications, and infections of the mammary glands (mastitis). Metabolic diseases and digestive upsets make up the bulk of the other health problems encountered.

A. Calving Complications

There have been six cases of dystocia that have been successfully resolved. Two cows have been lost because of calving complications. Cow No. 17 suffered a severe dislocation of the right hip while calving on August 22, 1968. As she showed no response to treatments, she was euthanized on August 31, 1968. Necropsy findings are reported in Appendix V.

Cow No. 28 suffered from dystocia on June 6, 1968, when NTS activities caused her to be unattended for 24 hours. The calf was in a dorsal-posterior presentation with retained hind feet causing a hip lock that resulted in dystocia. The calf was delivered manually but had been dead for some time as there was epilation of the hair. These complications led to retained placenta and metritis. The cow also suffered from severe mastitis of the right fore and rear quarters. Despite intensive treatment the cow died on June 15, 1968. Cause of death was determined to be a septicemia from the mastitis and metritis which developed subsequent to the dystocia.

There have been five cases of retained placenta. These are usually associated with dystocia and/or multiple births. Treatment is with intravenous injections of a purified oxytocin principle, the manual removal of the placental membranes, and the placement of medicated intrauterine boluses. All cases have responded.

B. Mastitis

The complexity of the etiology of this condition makes solution of the problem dependent upon (1) clinical diagnosis of the specific microbial agent involved, (2) correction of faulty managerial practices, and (3) judicious use of drug therapy. Methods for the detection of mastitis consist of physical, chemical, or microbiological tests applied to the udder or milk. Physical tests include palpation, observation of inflammation of the udder, visual examination of the milk by use of the strip cup. Prior to applying the milking machine, two to three free-flowing streams from each teat are squirted into the strip cup. An abnormal finding i.e., clumps, serum, blood, etc., is classified as mastitis. Chemical tests are limited to a monthly California Mastitis Test (CMT). If the test is positive, i.e., if the leukocyte count is above normal, the affected quarter is assumed to have mastitis. Microbiological tests *per se* are not done. However, antibiotic sensitivity tests are done if the affected quarter does not respond to standard treatment.

All suspects are treated as cases of acute mastitis. As determined by sensitivity tests and prior history, the antibiotic of choice is infused into the affected quarter following each milking for no less than six treatments. Additional treatment is given as indicated. This may include parenteral antibiotics, fluid therapy, diuretics, hormones and/or rumen stimulants, depending on the clinical response. Spread of mastitis from infected cows to healthy cows is reduced by using separate milking buckets, milking infected animals last, isolation of infected cows, prevention of spilling of infected milk on floors, disinfection of teat cups, and other methods usually employed in strict sanitation programs.

When a cow with a history of mastitis is dried up, 30 cc of Furacin®[1] is infused into each quarter. This is repeated 4-6 weeks prior to parturition. By following this method religiously, the incidence of mastitis has been reduced considerably.

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[1] Eaton Laboratories, Norwich, New Jersey.

As shown in Figure 5, our incidence of mastitis is quite low with an average of 1.2 cases per month. The average percentage of our herd infected each day is .9 percent. (Incidence from May 1964 - June 1966 was 1.7 percent.) However, we have had four serious episodes of mastitis, which either resulted in permanent damage to the lactating tissue of the mammary gland or in death, as in the case of Cow No. 29. (See Appendix VI.) The mastitis incidence in individual cows is related in Appendix VII.

C. Metabolic and Digestive Conditions

There are five cows (16, 44, 45, 46, and 84) that usually suffer from parturient paresis (milk fever) at parturition. The standard treatment of intravenous infusion of 500 cc calcium borogluconate, usually controls the problem. However, on September 15, 1966, Cow No. 24 was treated and apparently responded, but during the night she relapsed and was dead when the livestock workers reported for work on the morning of the 16th.

As a prophylatic treatment, each cow, approaching parturition, is injected with 50 cc of Cal-Gly-Phos®[1], intramuscularly. This is administered every seven days until the cow calves. No dramatic decline in the incidence of parturient paresis has been noted, however, the severity of the condition seems to be lessened.

There have been three cases of ketosis, all of which have been successfully treated with the standard corticosteroid and glucose therapy.

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[1] H. C. Burns Company, Inc., Oakland, California.

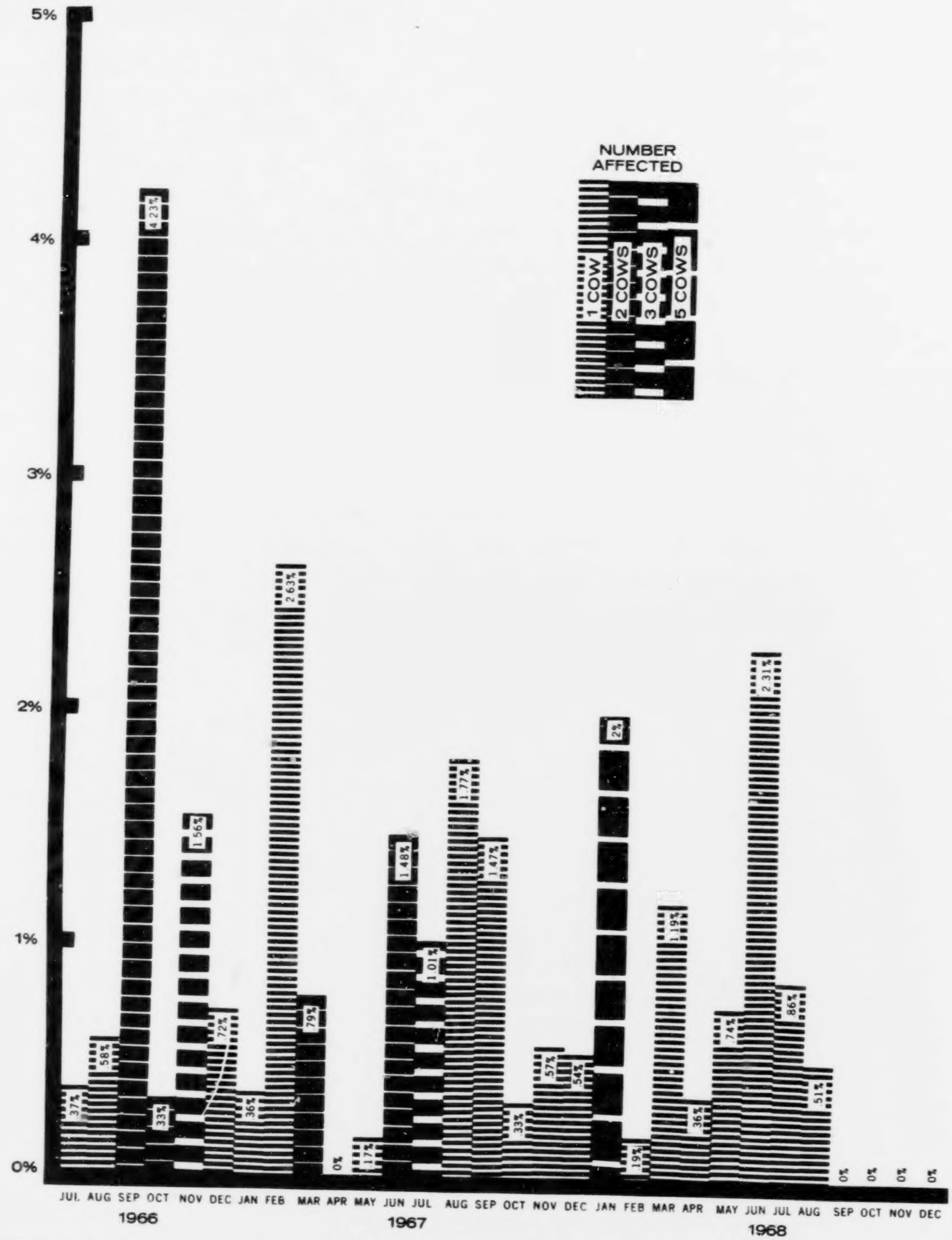

Figure 5. Percent of Mastitis Incidence in USPHS Dairy Herd by Cow Days per Month

Tympanites (bloat) has occurred when cows are fed a large amount of fresh alfalfa green chop without a preliminary feeding of hay. All cases of bloat were successfully relieved by administering surface wetting agents and by bleeding off the rumen gas via a stomach tube. When the cows are on green chop, they are fed a bloat preventive containing poloxalene which has eliminated all bloating incidents.

There was one case of traumatic gastritis (hardware disease) during this period. Cow No. 5 became sick in early March of 1967; despite intensive therapy she expired on June 25, 1967. (See Appendix VIII for history and necropsy details.)

Because prevention of traumatic gastritis is more important than the medical or surgical treatment of the condition, magnets are placed in the rumens of all the dairy cows. This, for the most part, prevents the penetration of metal particles through the rumen wall into the abdominal or thoracic cavities. In addition to this, there has been a concentrated effort to strip lots and mangers of any pieces of baling wire or other metal objects that could be ingested. Care is taken to prevent the placement of wire in the hay manger during feeding. Hay produced on the Area 15 Farm is baled with twine which eliminated another source of hardware.

HERD PARTICIPATION IN USPHS EXPERIMENTS

The USPHS Area 15 Experimental Farm and dairy herd are used, primarily, for the assessment of radioiodine uptake by dairy cows. There have been four ^{131}I controlled release experiments conducted at the farm between July 1, 1966 and December 31, 1968. Two of these experiments (SIP and HARE) consisted of dry aerosols of diatomaceous earth tagged with ^{131}I which was generated over growing forages. One, Rainout, was a ^{131}I hydrosol which was sprayed on a forage plot and one, MICE, was a release of molecular $^{131}I_2$. In addition to these controlled releases, the dairy herd is used for ^{131}I uptake studies from forages contaminated by the fallout from reactor effluent or Plowshare cratering events. Studies were conducted for one reactor run, Phoebus, and three Plowshare events, Cabriolet, Buggy, and Schooner.

Basically the cows were handled the same for all of these experiments. Each cow is assigned a specific forage ration, which may be spread hay, baled hay, chopped baled hay, spread alfalfa green chop, fresh alfalfa green chop, or fresh sudan green chop. The cow is placed in an individual feeding pen and fed a definite weight of the forage on an assigned schedule. A sample of each feeding of forage is collected and submitted for gamma spectroscopy analysis. The amount of uneaten residue is also determined so that the total intake of each cow is known. The total production at each milking is determined and a milk sample is collected for gamma spectroscopy so that each cow's output in the milk is also determined. The standard operating procedures for conduct of dairy cow experiments are listed in SWRHL-55r.

In addition to these ^{131}I feeding experiments, selected cows have been administered ^{131}I via capsules and then placed in metabolism stalls where the ^{131}I output in the urine and feces was also measured. The basic objective of these experiments is to provide data which will be used to develop a mathematical model for the accurate prediction of the amounts of radioiodine which will appear in the milk of dairy cows at any specified time after exposure. The details and results may be found in the technical report for each experiment as listed in Table 2.

Appendix IX lists the cows by number and shows their participation in all experiments.

Appendix X lists each experiment chronologically and shows the type of exposure of each participating cow.

In addition to the above experiments, in August and September of 1966 the USPHS dairy herd was utilized by Dr. Dewitt G. Hazzard, Research Branch, Division of Radiological Health, Rockville, Maryland, to determine the *in vivo* binding effect of various levels of verxite on ^{134}Cs. The cows each received 0.2 μc of ^{134}Cs in the afternoon grain for 18 days. Group I cows (5, 16, 21, and 43) received 1.8 pounds of verxite each morning for 23 days; Group II cows (2, 22, 28, and 46) received 1.2 pounds for the same period; Group III cows (12, 13, 18, and 41) received 0.6 pounds; and Group IV cows (15, 19, 26, and 45) received no verxite. Results of this experiment were published in June 1967, (Vol 50, p. 992) Journal of Dairy Science. The title of the article was "Verxite Flakes for *in vivo* Binding of ^{134}Cs in Cows."

Since little information is available concerning the uptake, secretion, and metabolism of the isotopes of tungsten, chromium, and iron, a preliminary study (Project Checkout) was designed. On January 20, 1967, an oral dose of 80 μCi ^{50}Cr, 45.4 μCi ^{59}Fe, and 608 μCi of ^{187}W was given to Cow No. 43 via a gelatin capsule. Milk samples were collected at each milking for the next six days. Analysis indicated that ^{50}Cr was not secreted in the milk; that ^{59}Fe is secreted in trace amounts; and that ^{187}W is secreted in the milk with an effective half life of 16 hours.

Table 2. List of Reports of Experiments Conducted 1 July 1966 - 31 December 1968

Experiment	SWRHL No.	Title of Report	Authors	Status of Report
Cesium 134 Verxite Study		Verxite flakes for *in vivo* binding of ^{134}Cs in cows	D. G. Hazzard T. J. Withrow B. H. Bruckner	Published in June 1967 issue (Vol 50) of the Journal of Dairy Science P. 992
Rainout	43r	^{131}I Transport through the air-forage-cow-milk system using an aerosol mist	R. Douglas S. Black D. Barth	To AEC for review on October 28, 1968
Phoebus				Report in preparation
SIP	39r	^{131}I Dairy cow uptake study using a submicrometer synthetic dry aerosol	B. Mason S. Black D. Barth	To AEC for review on February 1, 1969
MICE	85r	Radioiodine transport through the air-forage-cow-milk system using a gaseous $^{131}I_2$ contaminant	R. Douglas S. Black	In review channels
Cabriolet				Report in preparation
Buggy				Report in preparation
Metabolism Studies 1 & 2	No No. Assigned	Radioiodine metabolism in dairy cows	W. Shimoda	Memorandum report

Table 2. List of Reports of Experiments Conducted 1 July 1966 - 31 December 1968 cont'd

Experiment	SWRHL No.	Title of Report	Authors	Status of Report
HARE	61r	Cow milk ^{131}I levels following ingestion of synthetically contaminated alfalfa or Sudan	S. Black D. Barth R. Stanley	To AEC for review on January 9, 1970
Schooner				Report in preparation

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1. Douglas, R. L. Status of the Nevada Test Site Experimental Farm. SWRHL No. 36r.

2. Smith, D. D. and Engel, R. E. Progress Report for Bioenvironmental Research, May 26, 1964 through July 1, 1966 - Part I: Experimental Dairy Farm. SWRHL No. 55r. 1966

3. Daley, E. M. and Smith, D. D. Agronomic Aspects of the Experimental Dairy Farm, June 1966 - December 1968. SWRHL No. 63r. 1969.

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APPENDIX I. Acquisition Data and Vital Statistics of Dairy Cows 1 July 1966 - 31 December 1968

Cow No.	Date of Birth Age as of 31 Dec 68	Weight Type of Breeding	Cost and Acquisition Date	Remarks
2	Nov 1958* 10 yrs 2 mos	1375 lbs Grade	$225 Spring 1964 Dispersal sale Idaho	In herd
5		Grade	$225 Spring 1964 Dispersal sale Idaho	Died 26 Jun 1967 Traumatic gastritis
11	Mar 1960* 8 yrs 9 mos	1485 lbs Grade	$225 Spring 1964 Dispersal sale Idaho	In herd
12	Mar 1960* 8 yrs 9 mos*	1600 lbs Grade	$225 Spring 1964 Dispersal sale Idaho	3-quartered cow In herd
13	Oct 1960* 8 yrs 3 mos	1650 lbs Grade	$225 Spring 1964 Dispersal sale	In herd

APPENDIX I. Acquisition Data and Vital Statistics of Dairy Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Date of Birth Age as of 31 Dec 68	Weight Type of Breeding	Cost and Acquisition Date	Remarks
15		Grade	$225 Spring 1964 Dispersal sale Idaho	Transferred to University of Nevada 25 Oct 1967
16	Nov 1958* 10 yrs 2 mos	1500 lbs Grade	$225 Spring 1964 Dispersal sale Idaho	In herd
17		Grade	$225 Spring 1964 Dispersal sale Idaho	Euthanized 31 Aug 1967 Hip displacement following calving
18	Nov 1958* 10 yrs 2 mos	1470 lbs Grade	$225 16 Aug 1964 U of Nev	In herd
19	14 Apr 1956 12 yrs 9 mos	1550 lbs Grade	$225 16 Aug 1964 U of Nev	In herd
21	26 Mar 1962 6 yrs 10 mos	1700 lbs Grade	$225 16 Aug 1964 U of Nev	In herd

APPENDIX I. Acquisition Data and Vital Statistics of Dairy Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Date of Birth Age as of 31 Dec 68	Weight Type of Breeding	Cost and Acquisition Date	Remarks
22		Grade	No charge 7 Nov 1964 U of Nev	Culled from herd Sacrificed - 13 Oct 1966 AIP Program
23		Grade	No charge 7 Nov 1964 U of Nev	Culled from herd Sacrificed - 13 Oct 1966 AIP Program
24		Registered	$400 Cantlon Farms 15 Nov 1964	Died 16 Sep 1966 Milk fever
25		Registered	$400 Oats Bros 15 Nov 1964	Culled from herd 17 Aug 1967 Transferred to U of Nev
26	24 Feb 1960 8 yrs 11 mos	1980 lbs Registered	$400 Oats Bros 15 Nov 1964	In herd
27	8 Dec 1961 7 yrs	1730 lbs Registered	$400 Cantlon Farm 15 Nov 1964	In herd

APPENDIX I. Acquisition Data and Vital Statistics of Dairy Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Date of Birth Age as of 31 Dec 68	Weight Type of Breeding	Cost and Acquisition Date	Remarks
28	24 Aug 1958 10 yrs 4 mos	Registered	$500 Oats Bros 15 Nov 1964	Dead - 16 Jun 1968 Calving complication
29		Registered	$400 Cantlon Farm 15 Nov 1964	Dead - 8 Feb 1968 Gangrenous mastitis
35	15 Jan 1965 3 yrs	1162 lbs Grade	Born in herd Dam was No. 18 Sire - U of Nev bull	In herd
36	30 Dec 1964 4 yrs	1239 lbs Grade	Born in herd Dam was No. 20 Sire - U of Nev bull	In herd
39	13 Apr 1965 3 yrs 8 mos	1423 lbs Registered	Born in herd Dam was No. 28 Sire - Oats bull	In herd
43	31 Oct 1962 6 yrs 3 mos	1812 lbs Registered	$450 Cantlon Farms 23 Jul 1965	In herd

APPENDIX I. Acquisition Data and Vital Statistics of Dairy Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Date of Birth Age as of 31 Dec 68	Weight Type of Breeding	Cost and Acquisition Date	Remarks
44	8 Nov 1959 9 yrs 5 mos	1910 lbs Registered	$450 Oats Bros 23 Jul 1965	In herd
45	14 Apr 1960 8 yrs 9 mos	1358 lbs Registered	$500 Oats Bros 23 Jul 1965	In herd
46	20 Sep 1960 8 yrs 4 mos	1720 lbs Registered	$500 Oats Bros 23 Jul 1965	In herd
47	17 Apr 1958 10 yrs 8 mos	1685 lbs Registered	$400 Oats Bros 23 Jul 1965	In herd
48	7 Mar 1962 6 yrs 10 mos	1500 lbs Registered	$400 Oats Bros 23 Jul 1965	In herd
55	8 Sep 1965 3 yrs 4 mos	1160 lbs Registered	Born in herd Dam was No. 48 Sire - Oats bull	Transferred University of Nev 30 Oct 1968

APPENDIX I. Acquisition Data and Vital Statistics of Dairy Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Date of Birth Age as of 31 Dec 68	Weight Type of Breeding	Cost and Acquisition Date	Remarks
62	16 Feb 1966 2 yrs 11 mos	1040 lbs Registered	Born in herd Dam was No. 43 Sire - U of Nev bull	In herd
71	3 Apr 1966 2 yrs 10 mos	1160 lbs Registered	Born in herd Dam was No. 48 Sire - Cantlon's Phantom	In herd
83	19 Jun 1962 6 yrs 6 mos	1385 lbs Registered	$499 Oats Bros 16 Nov 1966	In herd
84	16 Sep 1960 8 yrs 4 mos	1690 lbs Registered	$450 Oats Bros 16 Nov 1966	In herd
85	28 Nov 1960 8 yrs 2 mos	1480 lbs Registered	$500 Oats Bros 16 Nov 1966	In herd
86	25 Jan 1962 7 yrs	1550 lbs Registered	$450 Oats Bros 16 Nov 1966	In herd

APPENDIX I. Acquisition Data and Vital Statistics of Dairy Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Date of Birth Age as of 31 Dec 68	Weight Type of Breeding	Cost and Acquisition Date	Remarks
87	27 Jul 1962 6 yrs 5 mos	1675 lbs Registered	$600 Oats Bros 16 Nov 1966	In herd

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*Estimated - as no records prior to purchase

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
2	5*	11/27/65 10/21/66 328 days	85	166	2x-bull	162	17,429	2.4% 418.3 lbs		
	6*	2/23/67 11/29/67 279 days	125	75	1x-bull	204	14,441	3.7% 543.3 lbs		
	7*	2/16/68 11/25/68 282 days	80	115	1x-bull	167	14,429	3.3% 476.2 lbs	10 yrs 2 mos*	
5	5*	1/31/66 11/3/66 276 days	150	173	2x-bull	103	11,790	2.6% 306.5 lbs		Cow died 26 Jun 67 after a prolonged illness due to penetrating harware (Traumatic reticulitis)
11	4*	9/21/66 7/31/67 313 days	329	150	3x-1 A.I.** 2x-bull	163	19,691	4.5% 886.1 lbs		Seriously ill with traumatic reticulitis during dry period There may have been fetal reabsorbtion.
	5*	11/29/67 9/4/68 279 days	121	80	1x-bull	199	16,671	3.6% 600.2 lbs	8 yrs 9 mos	
12	4*	2/24/66 12/15/66 294 days	66	77	1x-bull	217	15,404	3.2% 492.9 lbs		Three-quartered cow resulting from mastitis prior to entry into herd.

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
	5*	2/9/67 9/30/67 233 days	56	29	1x-A.I.	204	9,092	3.6% 327.3 lbs		
	6*	1/5/68 9/4/68 242 days	97	59	2x-1 A.I. 1x-bull	183	11,691	3.8% 444.3 lbs	8 yrs 9 mos	
13	4*	5/31/67 4/12/67 315 days	102	143	4x-2 A.I. 2x-bull	172	15,246	3.3% 503.1 lbs		Twins
	5*	7/27/67 5/17/68 294 days	106	81	1x-bull	213	13,705	3.5% 479.7 lbs	8yrs 3 mos*	
15	7*	4/12/66 1/25/67 258 days	123	96	1x-A.I.	162	15,301	2.7% 413.1 lbs		
	8*	4/4/67	99	No data as cow used as nurse cow prior to culling from herd						Twins - Due to age cow's udder became pendulous and difficult to milk so convert-to nurse cow and shipped to University of Nevada 25 Oct 67.

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
16	5*	2/11/66 2/12/67 366 days	190	155	1x-bull	211	21,445	3.0% 643.4 lbs		Cow's heat periods are very inapparent and hard to detect. This is the reason for the long open period.
	6*	4/25/67 2/6/68 288 days	72	81	1x-bull	201	18,032	3.7% 667.2 lbs	10 yrs 2 mos*	
17	3*	11/10/65 8/3/66 266 days	347	42	1x-bull	224	12,065	3.3% 398.1 lbs		Illness terminated previous lactation at 137 days, therefore, a very long open period.
	4*	10/7/66 7/6/67 272 days	65	36	1x-bull	236	9,502	3.6% 342.1 lbs		
	5*	8/22/67	47		No data as cow died 31 Aug 67					Calving injury caused displacement of hip - Euthanized 31 Aug 67.
18	5*	1/27/66 11/3/66 280 days	57	63	1x-bull	217	14,438	2.8% 404.3 lbs		

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
	6*	1/8/67 8/22/67 226 days	66	66	2x-bull	160	10,546	3.3% 348.0 lbs		
	7*	12/22/67 8/17/68 238 days	122	131	4x-2 A.I. 2x-bull	107	10,859	3.5% 380.1 lbs	10 yrs 2 mos*	
19	8	6/13/66 3/9/67 269 days	189	165	2x-bull	104	10,943	3.1% 339.2 lbs		
	9	9/21/67 5/28/68 249 days	196	183	2x-bull	66	9,298	3.0% 278.9 lbs	12 yrs 9 mos	
21	3	6/13/66 4/14/67 305 days	75	143	2x-1 A.I. 1x-bull	162	17,022	Information not available		
	4	8/10/67 5/17/68 280 days	118	88	2x-1 A.I. 1x-bull	192	16,044	4.0% 641.8 lbs	6 yrs 10 mos	
24	6	9/14/66	76							Cow died on 16 Sep 66. Parturient paresis.

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
25	6	1/16/67 8/9/67 205 days	214	49	1x-bull	156	13,004	2.5% 325.1 lbs		Lactation ended early as cow culled from herd because of pendulous udder.
26	4	2/24/66 11/10/66 259 days	225	234	5x-2 A.I. 3x-bull	25	15,097	3.2% 483.1 lbs		Difficult cow to settle. Many breedings.
	5	7/27/67 4/11/68 258 days	258	203	1x-bull	55	11,748	3.4% 399.4 lbs	8 yrs 11 mos	No heats observed for six months. Treated with estrovarian. Severe injury to left rear teat caused early end of lactation.
27	3	8/21/66 7/5/67 318 days	66	61	1x-bull	257	18,073	3.1% 560.3 lbs		
	4	7/25/67 4/6/68 255 days	20	84	1x-bull	171	10,441	3.1% 323.7 lbs	7 yrs	
28	6	3/8/66 11/10/66 247 days	68	58	1x-A.I.	189	12,022	2.6% 312.6 lbs		Twins

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
	7	2/12/67 10/28/67 258 days	94	179	2x-A.I.	79	8,231	3.5% 288.1 lbs		Acute coliform mastitis from 14-27 Feb. Cow recovered but left quarter was atrophied.
	8	6/6/68	221		No data as cow died 16 Jun 68				10 yrs 4 mos	Cow developed mastitis and metritis after calving and died 16 Jun 68.
29	4	8/30/65 7/6/66 310 days	81	310	2x-bull	0	14,344	2.9% 416.0 lbs		Evidently fetal reabsorbtion as positive pregnancy test 16 Mar 66 - no heat reported
	5	4/19/67 2/5/68 292 days	287	95	1x-bull	197	15,649	4.4% 688.6 lbs		Cow died of periacute gangrenous mastitis on 8 Feb 68.
35	1	3/20/67 12/19/67 274 days		60	1x-bull	214	9,432	3.5% 330.1 lbs	3 yrs 11 mos	Dam was No. 18
36	1	4/16/67 12/19/67 247 days		76	1x-A.I.	171	8,006	2.6% 208.2 lbs	4 yrs	Dam was No. 20

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
	4	9/6/67 6/20/68 286 days	67	163	1x-bull	123			6 yrs 10 mos	Nurse cow for replacement calves. No production data.
55	1	6/13/68 8/23/68 71 days						3.9% 62.3 lbs		Dam was No. 48. Allowed to nurse calf during first lactation. Poor producer so shipped to University of Nevada on 30 Oct 68.
71	1	1/10/68 8/17/68 219 days		133	3x-bull	86	6,004	3.9% 234.2 lbs	2 yrs 10 mos	First lactation. Dam was No. 44.
83	2	11/23/66 9/10/67 291 days	Unknown	88	2x-1 A.I. 1x-bull	203	15,732	3.5% 550.6 lbs		Purchased 16 Nov 66 from Oats Bros, Fallon, Nevada.
	3	11/30/67 8/17/68 260 days	81	54	1x-bull	206	14,777	3.3% 487.6 lbs	6 yrs 6 mos	
84	3	8/31/66 4/22/67 157 days in herd*	Unknown	84	2x-1 A.I. 1x-bull	150	12,151	3.7% 449.6 lbs		157 days in PHS herd. Purchased 16 Nov 66 from Oats Bros, Fallon, Nevada

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
39	1	4/9/67 12/19/67 254 days		115	3x-bull	139	8,269	3.5% 289.4 lbs	3 yrs 8 mos	Dam was No. 28
43	2	2/16/66 1/25/67 343 days	61	269	6x-3 A.I. 3x-bull	74	17,657	3.8% 671.0 lbs		Left rear quarter contains scar tissue from previous mastitis infection
	3	8/20/67 7/1/68 315 days	207	74	1x-bull	241	15,086	4.5% 678.9 lbs	6 yrs 3 mos	
44	5	4/3/66 2/13/67 316 days	135	216	4x-2 A.I. 2x-bull	100	15,603	2.9% 452.5 lbs		Acute coliform mastitis 4-21 Sep 66. Right fore quarter atrophied.
	6	8/16/67 5/17/68 274 days	184	120	1x-bull	154	12,172	3.5% 426.0 lbs	9 yrs 5 mos	Lowered milk production capability because of scar tissue in fore quarter.
45	4	2/13/66 11/10/66 270 days	101	92	2x-1 A.I. 1x-bull	178	14,047	3.1% 435.5 lbs		
	5	3/1/67 11/9/67 253 days	111	122	2x-1 A.I. 1x-bull	131	12,549	3.7% 464.3 lbs		

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
	6	4/10/68 12/10/68 244 days	152	86	1x-bull	158	12,546	3.3% 414.0 lbs	8 yrs 9 mos	
46	4	6/25/66 4/26/67 305 days	128	131	2x-1 A.I. 1x-bull	174	14,086	2.5% 352.2 lbs	8 yrs 9 mos	
	5	8/10/67 4/6/68 239 days	105	114	3x-bull	125	9,335	3.6% 336.1 lbs	8 yrs 4 mos	
47	6	4/2/66 12/15/66 257 days	86	132	1x-A.I.	125	12,689	2.8% 355.3 lbs		
	7	5/16/67 1/25/68 254 days	152	133	1x-bull	121	10,993	4.1% 450.8 lbs	10 yrs 9 mos	
48	3	10/5/66 7/1/67 269 days	126	53	1x-bull	216	13,009	3.5% 455.3 lbs		Twins

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
	4	8/31/67 5/17/68 259 days	131	78	2x-bull	181	10,335	3.6% 372.1 lbs	8 yrs 4 mos	
85	4	7/16/66 5/29/67 317 days 194 days in herd	Unknown	243	2x-1 A.I. 1x-bull	74	14,957	3.5% 523.5 lbs		194 days in PHS herd. Purchased 16 Nov 66 from Oats Bros, Fallon, Nevada.
	5	12/23/67 10/23/68 304 days	208	92	1x-bull	212	15,995	3.9% 623.8 lbs	8 yrs 2 mos	
86	3	8/11/66 4/11/67 243 days 146 days in herd	Unknown	102	1x-bull	141	12,366	3.7% 457.5 lbs		146 days in PHS herd. Purchased 16 Nov 66 from Oats Bros, Fallon, Nevada.
	4	8/31/67 4/6/68 218 days	142	63	1x-bull	155	8,791	3.9% 342.8 lbs	7 yrs	

APPENDIX II. Production and Reproduction of Cows 1 July 1966 - 31 December 1968 (continued)

Cow No.	Lactation No.	Period & Length of Lactation	Days Dry Preceeding Lactation	Open Days	No. & Type of Breeding	Days Carried Calf	Pounds Milk Production	Average Butterfat % and lbs	Age as of 31 Dec 68	Remarks
87	3	12/7/66 10/18/67 315 days	Unknown	100	2x-1 A.I. 1x-bull	215	17,112	3.4% 581.8 lbs		Purchased 16 Nov 66 from Oats Bros, Fallon, Nevada
	4	12/23/67 11/22/68	65	260	3x-1 A.I. 2x-bull	74	15,752	3.4% 535.6 lbs	6 yrs 5 mos	Breeding problems. Widely separated heat periods.
Herd Average Data	4.75	272 days	128	117	1.8	158	13,330	3.4% 449.3 lbs	7.5 yrs	

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*Estimated as no records prior to purchase
**A.I. = Artificial Insemination

APPENDIX III. Replacement Cows for the U. S. Public Health Service Dairy Herd

INTRODUCTION

To keep the herd at the necessary level of production, new cows must replace those that have served a useful purpose but are no longer within acceptable standards. We try to maintain a herd of 18 lactating cows. This number of animals can be cared for efficiently with the available staff and is large enough to provide an adequate number of cows per group for our experiments. In order to maintain this number of milking cows, it is necessary to have a herd of from 26 to 28 cows in various stages of pregnancy and lactation. New animals are required periodically to replace aged animals, animals lost through death, and animals whose mammary glands are damaged by injury or by infection. Commercial dairies usually replace one-sixth of the entire herd each year.(1)

The two major avenues of providing the required replacements are (1) to establish a breeding program and raise our replacement stock or (2) to purchase mature cows on the open market. This report discusses the advantages and disadvantages of the two different procedures.

PURCHASE OF REPLACEMENTS

The isolation of our research facilities makes the locating of suitable replacement animals extremely difficult and time consuming. Eligible replacements are usually sold from herds because of some undesirable trait, i.e., low butterfat, poor temperament, difficult or slow milkers, or because of some physical or metabolic anomaly that makes them prone to lameness, mastitis, milk fever, ketosis, etc. In other words, we are usually purchasing high-grade culls, as most producers are reluctant to sell the better cows.

When we purchase cows that meet our standard criteria, transportation becomes a major problem. The animals must be trucked; and, in most cases, this involves a long distance through a desert environment. Since these animals are usually not acclimated to the desert environment, travel must be at night in the summer or only during the cool part of the year. Adjustment to the new surroundings is usually slow. Initially, they show weight loss, inappetence, and declining milk production. These characteristics are undesirable, as data collected during an experiment may not be a true reflection of what occurs in the normal cow.

Infectious diseases can exist in any dairy herd--latent or actual. Brucellosis, leptospirosis, infectious bovine rhinotracheitis, tuberculosis, vibriosis, and trichomoniasis are a few of the diseases that must be guarded against. Despite our precautions to prevent introducing an infectious condition into our herd, the potential still exists.

An advantage in purchasing an animal, though, is that through the study of her previous lactation records we can determine what type of production can be expected after she becomes adjusted to her environment. This, of course, is only true of animals purchased which have previous records available.

RAISING REPLACEMENT HEIFERS

Because of possible legal consequences, the AEC does not permit any animal that has been maintained on the NTS to enter commercial marketing avenues. This makes the disposal of surplus calves and cull cows extremely difficult. They must either be euthanized or transferred to another U. S. Government agency. Transfers are expensive and time consuming.

As a breeding program is necessary to maintain a dairy herd in full milk production, it seems logical to use the calves for replacement purposes rather than destroying them. Calves raised on our farm are adjusted to the desert environment and are not greatly influenced by the stresses of the climate when they reach maturity. As time goes on, our herd will become very closely related genetically, and every animal should respond similarly to the same conditions.

Surplus milk is used to feed the calves for the first few months of their lives so expensive milk replacements are not required. The mild desert climate and isolation of the area reduces health problems to a minimum and expensive housing is not required.

During the first three years of our dairy's operation, i.e., from 1964 to 1967, we purchased our replacement cows from dairies in Northern Nevada. Since 1967 we have utilized our own registered Holstein heifers as replacements. Six heifers have entered our milking string and five have proven to be suitable replacements. A major disadvantage of raising replacement heifers is that we must wait 2-1/2 to 3 years before an animal can enter the herd. There is always the risk that after this long waiting period an animal will not be suitable. Through artificial insemination, at a nominal cost ($2.00 per breeding), sires can be selected which will improve the weak points of our herd; i.e., increase the butterfat percentage, strengthen rear legs, etc.

ECONOMICS

In this area of the Southwest, the average price paid for registered first-calf heifers of good breeding is $450 to $500. A registered second-lactation cow, with a 305-day production record showing 3.5 percent butterfat and 15,000 pounds of milk, will cost at least $600.(2) To these basic prices must be added the time required to locate, examine, and select the animals and the transportation cost. Because of the supply and demand, these animals usually meet our minimum standards but are not equal to the average cow in our herd.

The average cost of raising a heifer from date of birth to a first calf is approximately $300 to $360.(3) The high cost of labor on the NTS may raise the figure somewhat; but, in this climate, the health and housing costs are held to a minimum. Personnel who milk and care for the dairy cows also care for the calves so little extra labor expense is involved.

SUMMARY AND CONCLUSION

The scientific advantages of raising our replacment animals are:

1. All animals are genetically similar in the herd.
2. Animals have lived their entire lives in the environment.
3. All age groups are represented.
4. It is easier to maintain a relatively disease-free herd.

The economic advantages of raising our replacement animals are:

1. Lower total cost.
2. Elimination of wasteful euthanasia of new calves--male calves can be utilized for terminal experiments, development of special surgical techniques, etc.
3. Eliminates the need for searching for replacements.

The only clear-cut drawback of raising replacement heifers is the element of risk that a heifer will not be a satisfactory replacement after raising her to three years of age. This risk should be small with the use of proven sires. The same risk exists when buying mature cows on the commercial market, especially when buying first-calf heifers.

Under the conditions existing at the NTS and under our operating rules, replacement of cows in our dairy herd by raising calves born to our own cows is more feasible than buying cows on the commercial market.

REFERENCES

1. Agr. Exp. Sta., Univ. Nev., Reno, Nev. Bulletin 195.
2. Personal communication with commercial dairymen and H. T. Adams, Extension Dairyman, Cooperative Extension Service.
3. Hoard's Dairyman 113(7). Apr. 10, 1968.

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
581	23 May 1964 Female Unknown	No. 4 Unknown	Angus-Holstein	Transferred to University of Nevada - 17 Aug 1967
582	5 Jul 1964 Female Unknown	No. 8 Unknown	Angus-Holstein	Transferred to University of Nevada - 17 Aug 1967
35	15 Feb 1965 Female 60 lbs	No. 18 Unknown	Holstein	2nd lactation as replacement cow
36	30 Dec 1964 Female 60 lbs	No. 20 Unknown	Holstein	2nd lactation as replacement cow
39	13 Apr 1965 Female 85 lbs	No. 28 & Oats Bull	Holstein	2nd lactation as replacement cow
40	29 May 1965 Male 80 lbs	No. 21 Unknown	Hereford-Holstein	Sacrificed 13 Oct 1966 - AIP semiannual beef sacrificing program
41	14 Jun 1965 Female 65 lbs	No. 13 & Hereford Bull	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1965 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
42	18 Jul 1965 Male 65 lbs	No. 25 & Oats Bull	Holstein	Sacrificed 1 Jun 1967 AIP semiannual beef sacrificing program
49*	4 Aug 1965 Female 50 lbs	No. 27 & Hereford Bull	Hereford-Holstein	Sacrificed 1 Jun 1967 AIP semiannual beef sacrificing program
50*	4 Aug 1965 Male 50 lbs	No. 27 & Hereford Bull	Hereford	Transferred to University of Nevada - 17 Aug 1967
51	24 Aug 1965 Female 50 lbs	No. 1 & Hereford Bull	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
53	1 Sep 1965 Female 50 lbs	No. 24 & Hereford Bull	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
54	30 Aug 1965 Male Unknown	No. 29 & Hereford Bull	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
55	8 Sep 1965 Female 55 lbs	No. 48 & Oats Bull	Regular Holstein	2nd lactation as replacement cow. Poor cow. Transferred to University of Nevada - 30 Oct 1968 in barter for Hereford Bull

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
57	27 Nov 1965 Male 60 lbs	No. 2 & AI H-195	Grade Holstein	Transferred to University of Nevada - 17 Aug 1967
58	25 Jan 1966 Female 81 lbs	No. 18 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
59	31 Jan 1966 Male 80 lbs	No. 5 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
60	11 Feb 1966 Male 80 lbs	No. 16 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
61	13 Feb 1966 Male 91 lbs	No. 45 & Oats AI	Regular Holstein	Transferred to University of Nevada - 17 Aug 1967
62	16 Feb 1966 Female 76 lbs	No. 43 & U of N Wis Burke AI	Regular Holstein	1st lactation as replacement cow
63	16 Feb 1966 Male 72 lbs	No. 22 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
64	16 Feb 1966 Male 73 lbs	No. 23 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
65	24 Feb 1966 Male 85 lbs	No. 26 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
67	24 Feb 1966 Female 80 lbs	No. 12 & 508	Hereford	Transferred to University of Nevada - 17 Aug 1967
68*	8 Mar 1966 Male 69 lbs	No. 28 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
69*	8 Mar 1966 Male 75 lbs	No. 28 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
70	2 Apr 1966 Male 88 lbs	No. 47 & Oats Bull	Regular Holstein	Dairy herd sire
71	3 Apr 1966 Female 84 lbs	No. 44 & Cantlon's Phantom	Regular Holstein	1st lactation as replacement cow

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
72	12 Apr 1966 Male 90 lbs	No. 15 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
73*	31 May 1966 Female 69 lbs	No. 13 & 509	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967 Freemartin
74*	31 May 1966 Male 79 lbs	No. 13 & 509	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
75	13 Jun 1966 Female 70 lbs	No. 19 & 509	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
76	13 Jun 1966 Male 75 lbs	No. 21 & 509	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
77	21 Aug 1966 Male 70 lbs	No. 27 & 508	Hereford-Holstein	Rumen fistula experiment Died 6 Aug 1967
78	15 Sep 1966 Male 75 lbs	No. 24 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
79	21 Sep 1966 Male 100 lbs	No. 11 & 508	Hereford-Holstein	Rumen fistula experiment Died 6 Aug 1967

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
80*	5 Oct 1966 Female 63 lbs	No. 48 & 508	Hereford-Holstein	Sacrificed for AIP 19 Oct 1967
81*	5 Oct 1966 Female 76 lbs	No. 48 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
82	7 Oct 1966 Male 88 lbs	No. 17 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
88	7 Dec 1966 Male 108 lbs	No. 87 & Moosehart Alliance	Holstein	Died 14 Dec 1966 Congenital malformation
89	8 Jan 1967 Female 50 lbs	No. 18 & 509	Hereford-Holstein	Dead at birth
90	16 Jan 1967 Female 73 lbs	No. 25 & AI H-46	Holstein	Retained for replacement for dairy herd
91	9 Feb 1967 Male 96 lbs	No. 12 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
92	12 Feb 1967 Female 88 lbs	No. 28 & AI H-46	Holstein	Retained for replacement for dairy herd
93	23 Feb 1967 Male 93 lbs	No. 2 & 508	Hereford-Holstein	Dead at birth
94	1 Mar 1967 Female 108 lbs	No. 45 & 508	Hereford-Holstein	Euthanized 16 Jun 1967 Broken leg
95	24 Mar 1967 Male 50 lbs	No. 5 & 509	Hereford-Holstein	Cow aborted as very ill. Premature. Dead on arrival
96	30 Mar 1967 Male 65 lbs	No. 35 & 508	Hereford-Holstein	Sacrificed 20 Jun 1967 Project SIP
97	9 Apr 1967 Female 65 lbs	No. 39 & 508	Hereford-Holstein	Sacrificed 20 Jun 1967 Project SIP
98	16 Apr 1967 Male 86 lbs	No. 36 & 508	Hereford-Holstein	Sacrificed 20 Jun 1967 Project SIP

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
99	19 Apr 1967 Female 68 lbs	No. 29 & 508	Hereford-Holstein	Sacrificed 20 Jun 1967 Project SIP
100	25 Apr 1967 Female Unknown	No. 16 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
101*	4 May 1967 Male 83 lbs	No. 15 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
102*	4 May 1967 Male 79 lbs	No. 15 & 508	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
103	16 May 1967 Male Unknown	No. 47 & AI H-32	Hereford-Holstein	Transferred to University of Nevada - 17 Aug 1967
104	25 Jul 1967 Male 83 lbs	No. 27 & 508	Hereford-Holstein	Bartered for bull University of Nevada 25 Oct 1967
105	27 Jul 1967 Male Unknown	No. 26 & 508	Hereford-Holstein	Bartered for bull University of Nevada 25 Oct 1967

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
106	27 Jul 1967 Male Unknown	No. 13 & 508	Hereford-Holstein	Bartered for bull University of Nevada 25 Oct 1967
107	10 Aug 1967 Female 81 lbs	No. 46 & 508	Hereford-Holstein	Bartered for bull University of Nevada 25 Oct 1967
108	10 Aug 1967 Male 96 lbs	No. 21 & 508	Hereford-Holstein	Transferred to beef herd - 20 Jun 1968 - Bartered to University of Nevada for Hereford Bull - 30 Oct 1968
109	16 Aug 1967 Male 86 lbs	No. 44 & 508	Hereford-Holstein	Transferred to beef herd - 20 Jun 1968 - Bartered to University of Nevada for Hereford Bull - 30 Oct 1968
110	20 Aug 1967 Female 80 lbs	No. 43 & 508	Hereford-Holstein	Transferred to beef herd - 20 Jun 1968 - Bartered to University of Nevada for Hereford Bull - 30 Oct 1968

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
111	22 Aug 1967 Male 94 lbs	No. 17 & 508	Hereford-Holstein	Transferred to beef herd - 20 Jun 1968
112	31 Aug 1967 Male 86 lbs	No. 84 & 508	Hereford-Holstein	Transferred to beef herd - 20 Jun 1968 - Bartered to University of Nevada for Hereford Bull - 30 Oct 1968
113	31 Aug 1967 Male 82 lbs	No. 86 & 508	Hereford-Holstein	Transferred to beef herd - 20 Jun 1968 - Bartered to University of Nevada for Hereford Bull - 30 Oct 1968
114	6 Sep 1967 Male 92 lbs	No. 48 & 508	Hereford-Holstein	Transferred to beef herd - 20 Jun 1968 - Bartered to University of Nevada for Hereford Bull - 30 Oct 1968
115	21 Sep 1967 Female 80 lbs	No. 19 & 508	Hereford-Holstein	Transferred to beef herd - 20 Jun 1968 - Bartered to University of Nevada for Hereford Bull - 30 Oct 1968
116	29 Nov 1967 Female 92 lbs	No. 11 & 70	Holstein	At Well 3 Dairy herd replacement

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
117	30 Nov 1967 Female 88 lbs	No. 83 & AI H-37	Holstein	At Well 3 Dairy herd replacement
118	22 Dec 1967 Male Unknown	No. 18 & 70	Holstein	Euthanized 28 Feb 1968 No use in program
119	23 Dec 1967 Female Unknown	No. 87 & 70	Holstein	At Well 3 Dairy herd replacement
No Numbers*	23 Dec 1967 Female & Male Unknown	No. 85 & 70	Holstein	Twins - Dead at birth Premature
120	5 Jan 1968 Male 95 lbs	No. 12 & AI H-37	Holstein	Euthanized 28 Feb 1968 No use in program
121	11 Jan 1968 Male 87 lbs	No. 71 & 509	Hereford Holstein	Euthanized 28 Feb 1968 No use in program
122	16 Feb 1968 Female 87 lbs	No. 2 & 70	Holstein	At Well 3 Dairy herd replacement

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
123	21 Feb 1968 Female 82 lbs	No. 35 & 70	Holstein	At Well 3 Dairy herd replacement
124	1 Apr 1968 Male 85 lbs	No. 36 & 70	Holstein	Utilized for experiments Surgery BMS-5P Died
125	10 Apr 1968 Male Unknown	No. 45 & 70	Holstein	Calf dead at birth Milk fever cow
126	15 Apr 1968 Male 90 lbs	No. 16 & 70	Holstein	Retained for possible herd sire
127	24 Apr 1968 Female 80 lbs	No. 62 & 70	Holstein	At Well 3 Dairy herd replacement
128	16 May 1968 Female 82 lbs	No. 39 & 70	Holstein	At Well 3 Dairy herd replacement
129	6 Jun 1968 Male Unknown	No. 28 & 70	Holstein	Dead at birth Prolonged dystocia

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
130*	14 Jun 1968 Male Unknown	No. 55 & 70	Holstein	Euthanized 14 Jun 1968 No use in program
131*	14 Jun 1968 Female Unknown	No. 55 & 70	Holstein	Euthanized 14 Jun 1968 Freemartin No use in program
132	1 Jul 1968 Female Unknown	No. 47 & 70	Holstein	Dairy herd replacement
133	19 Jul 1968 Female 79 lbs	No. 13 & 70	Holstein	Dairy herd replacement
134	25 Jul 1968 Female 79 lbs	No. 27 & 70	Holstein	Dairy herd replacement
135	7 Aug 1968 Female 84 lbs	No. 43 & 70	Holstein	Dairy herd replacement

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
136	7 Aug 1968 Male Unknown	No. 86 & 70	Holstein	Dead at birth
137*	14 Aug 1968 Male 73 lbs	No. 84 & 70	Holstein	Twin - Euthanized 16 Aug 1968 - No use in program
138*	14 Aug 1968 Female 71 lbs	No. 84 & 70	Holstein	Twin - Euthanized 16 Aug 1968 - Freemartin No use in program
139	21 Aug 1968 Female Unknown	No. 21 & 70	Holstein	Dairy herd replacement
140	6 Sep 1968 Male 94 lbs	No. 46 & 70	Holstein	Euthanized - 19 Sep 1968 - No use in program
141	14 Oct 1968 Male Unknown	No. 44 & 70	Holstein	Dead at birth as cow suffered from parturient paresis prior to birth
142 & 143*	20 Oct 1968 Females Unknown	No. 83 & AI H-37	Holstein	Calves were dead at birth as cow developed dystocia during unattended hours of the night

APPENDIX IV. Calves in Herd or Born into Herd Since 1 July 1966 (continued)

Animal No.	Date of Birth Sex Wt. at Birth	Dam & Sire	Type of Breeding	Remarks
144	22 Nov 1968 Male Unknown	No. 11 & 70	Holstein	Euthanized 25 Nov 1968 - No use in program
145	25 Nov 1968 Male Unknown	No. 48 & 510	Hereford-Holstein	Euthanized 27 Nov 1968 - No use in program
146	29 Nov 1968 Male Unknown	No. 26 & 70	Holstein	Euthanized 29 Nov 1968 - No use in program
147	9 Dec 1968 Female Unknown	No. 12 & 70	Holstein	Calf died 17 Dec 1968 from enterotoxemia

*Twins

APPENDIX V. UNITED STATES PUBLIC HEALTH SERVICE
BIOENVIRONMENTAL RESEARCH PROGRAM
ROUTINE VETERINARY NECROPSY PROTOCOL

AIP NO: AHU-17-NTS-67

Tissues for Histopathology:		Sample Code	Sample for Radioanalysis:		Wt. Gms.	SWRHL Code 62-	Date SWRHL Received
Heart	X	AbC	Abomasum				
Kidney L ____ R	X		Content	X	260.0	033062	
Liver	X	AbT	Abomasum				
Lung	X		Tissue	X	190.1	033064	
Muscle	X	BoF	*Bone, Femur	X	1350.6	033065	
Spleen	X	BoH	**Bone, Hock				
Thyroid	X	Li	Liver	X	359.2	033060	
Adrenal	X	Lu	Lung(Tips)	X	114.1	033066	
AbT	X	Mu	Muscle	X	423	033063	
		RuC	Rumen				
			Content	X	212.1	033061	
		Th	Thyroid	X	58	033067	

Other Tissue: ____

* Bovine ** Wildlife Ruminants

DATE HISTOPATHOLOGY TISSUES SHIPPED: ____ CASE ACCESSION NO: CNG 54

SCIENTIFIC NAME: ____ PHOTO NO: ____

AIP NO: AHU-17 OTHER NO: ____

HISTORY: Cow #17 calved during early morning hours of 22 Aug. Both cow and calf were up when livestock worker arrived at 0600 hours. Cow was favoring her right leg. At 1400 hours calf was brought to barn, the cow followed but still limped on the right rear leg. At 1530 hours, she slipped in the holding pen and was assisted to her feet.

On 23 Aug the cow was milked in a.m. and p.m. but still showed lameness of right hind leg. She was given 5 cc POP for retained placenta.

On 24 Aug cow was down 50 ft. from barn at 0600 hours and was unable to get up. She was (Continued on attached sheet)

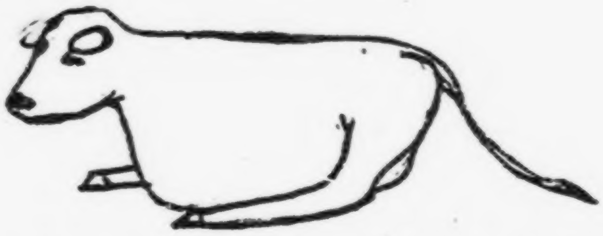
DATE OF DEATH: 8/31/67 HOUR: 0915 LOCATION: Area 15

DATE OF NECROPSY: 8/31/67 HOUR: 0920 LOCATION: Area 15

SEX: F AGE: 7-1/2 yrs. WEIGHT: 720 kg METHOD: Scales

SPECIES: Bovine COMMON NAME: Cow BREED: Holstein Angus X

EXTERNAL APPEARANCE: Cow is in very good condition. She is resting on her sternum with her forelegs normally flexed. The rear legs are extended foreward along the sides of the body. Rear legs are at about a 30° angle from the body. (See sketch) There is a scanty reddish brown discharge from the vulva.



PRIMARY INCISION: The cow is lying on her left side. A midline incision is made and the forelegs are reflected dorsally with the skin. Much yellow subcutaneous fat is present. There is an edematous area over the right jugular furrow. This area contains a gelatinous mass approximately 18 cm long x 6 cm wide x 3 cm deep. This lesion is probably the result (Continued on attached sheet)

APPENDIX V. UNITED STATES PUBLIC HEALTH SERVICE
BIOENVIRONMENTAL RESEARCH PROGRAM
ROUTINE VETERINARY NECROPSY PROTOCOL

AIP NO: AHU-17-NTS-67

es for Histopathology:	Sample Code	Sample for Radioanalysis:	Wt. Gms.	SWRHL Code 62-	Date SWRHL Received
X	AbC	Abomasum			
y L____ R X		Content X	260.0	033062	____
X	AbT	Abomasum			
X		Tissue X	190.1	033064	____
e X	BoF	*Bone, Femur X	1350.6	033065	____
n X	BoH	**Bone, Hock ____	____	____	____
id X	Li	Liver X	359.2	033060	____
al X	Lu	Lung(Tips) X	114.1	033066	____
X	Mu	Muscle X	423	033063	____
	RuC	Rumen			
		Content X	212.1	033061	____
	Th	Thyroid X	58	033067	____

Tissue: ____

* Bovine ** Wildlife Ruminants

HISTOPATHOLOGY TISSUES SHIPPED: ____ CASE ACCESSION NO: CNG 54

TIFIC NAME: ____ PHOTO NO: ____

D: AHU-17 ____ OTHER NO: ____

Y: Cow #17 calved during early morning hours of 22 Aug. Both cow and calf were up livestock worker arrived at 0600 hours. Cow was favoring her right leg. At 1400 hours, was brought to barn, the cow followed but still limped on the right rear leg. At 1530 , she slipped in the holding pen and was assisted to her feet.

Aug the cow was milked in a.m. and p.m. but still showed lameness of right hind leg. s given 5 cc POP for retained placenta.

Aug cow was down 50 ft. from barn at 0600 hours and was unable to get up. She was nued on attached sheet)

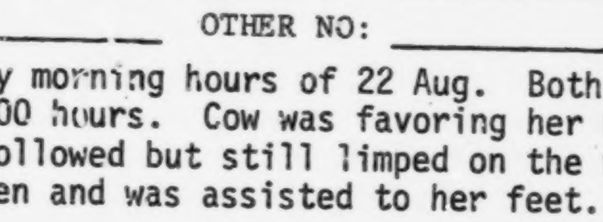
F DEATH: 8/31/67 HOUR: 0915 LOCATION: Area 15

F NECROPSY: 8/31/67 HOUR: 0920 LOCATION: Area 15

F AGE: 7-1/2 yrs. WEIGHT: 720 kg METHOD: Scales

S: Bovine COMMON NAME: Cow BREED: Holstein Angus X

L APPEARANCE: Cow is in very good condition. She is resting on her sternum with her gs normally flexed. The rear legs are extended foreward along the sides of the body. egs are at about a 30° angle from the body. (See sketch) There is a scanty reddish discharge from the vulva.



2

INCISION: The cow is lying on her left side. A midline incision is made and the s are reflected dorsally with the skin. Much yellow subcutaneous fat is present. s an edematous area over the right jugular furrow. This area contains a gelatinous proximately 18 cm long x 6 cm wide x 3 cm deep. This lesion is probably the result ued on attached sheet)

HISTORY (Continued)

treated for possible parturient paresis or ketosis. She was given 500 cc Dextrosol (Norden) I.V.; 500 cc Calsem-D (Massengill) I.V.; 20 mg Azium (Schering) I.M.; and 900 cc Dilusol (Diamond) I.V. An unsuccessful attempt was made to remove the placenta. She was given 4 sulfa urea boluets intra-uterine and 10 cc Mycillin V, I.M.

25 Aug 67 - cow lifted with tractor - could not stand at all on rear legs.

28 Aug 67 - cow given 500 cc Am Bex (Corvel) I.V. and 500 cc C.P.H.(Cutter) I.V.

Although cow continued bright, alert and had good appetite, she remained down. Her rear legs were extended forward in a frog like position. It was decided to euthanize her on 31 Aug 67. She was sacrificed at 9:15 with captive bolt pistol.

PRIMARY INCISION (Continued)

of a faulty intravenous injection. There are areas of bruising and edematous infiltration over the sternum, in front of the udder and over the hips. These are probably the result of slinging the cow while trying to get her on her feet.

There are extensive bruises and edematous areas over the posterior portion of the hips, most probably caused by pressure necrosis resulting from the sitting position she assumed.

MISCELLANEOUS (Continued)

The head of the femur is pulled out of the acetabulum. The round ligament is completely severed. Musculature over the sternum has a cooked appearance, probably from pressure necrosis.

DIGESTIVE SYSTEM: Liver is yellowish in color and rather friable. Rumen contains approximately 35 liters of dry green ingesta. The reticulum is clean with no hardware, gravel or magnets found. The omasum is impacted. There are thin layers of very, very dry ingesta between the leaves. The abomasum contains approximately one liter of brownish fluid. Mucosa is normal. The intestinal tract contains scanty amounts of semi-fluid fecal matter. Mucosa is normal in appearance throughout its length.

GENITO-URINARY SYSTEM: No lesions are observed in the kidneys or bladder. The uterus shows little involution and contains approximately 1 liter of brownish red putrid fluid. The cow has metritis from the retained placenta.

RESPIRATORY SYSTEM: Lungs are normal with the exception of a few atelectatic lobules on the edge of the diaphragmatic lobes. The left cardiac lobe shows some atelectatic involvement.

CARDIOVASCULAR SYSTEM: No lesions observed.

MISCELLANEOUS: As the medial muscles proxinal to the right stifle are reflected, a muscle mass, 5 cm in diameter, shows extensive necrosis for it's entire length. It has a cooked appearance. Another bundle of muscle approximately 6 cm in width has been torn loose from it's medial attachment at the right hip joint. Other adducting muscles show this same necrosis at their attachment on the pubis. The marginal cartlidge of the right acetabulum shows extensive necrosis. (Continued on attached sheet)

ORGAN WEIGHTS AND MEASUREMENTS:

Lung wt. 4372.7 gms

Left Apical	229.0 gms	Right Apical	401.9 gms
Left Cardiac	157.5 gms	Right Cardiac	227.9 gms
Left Diaphragmatic	1689.9 gms	Right Diaphragmatic	1517.5 gms
		Intermediate	149.0 gms

Thyroid wt: 59 gms (Before pathology sample taken)
Thyroid wt: 58 gms (After pathology sample taken)

COPIES TO: Farm

PROSECTOR: Dr. D. D. Smith

AIP NO: AHU-17-NTS-67

DATE OF NECROPSY: 31 August 1967

HOUR: 0920

APPENDIX VI. UNITED STATES PUBLIC HEALTH SERVICE
BIOENVIRONMENTAL RESEARCH PROGRAM
ROUTINE VETERINARY NECROPSY PROTOCOL

AIP NO: AHU-29-NTS-68

Tissues for Histopathology:		Sample Code	Sample for Radioanalysis:	Wt. Gms.	SWRHL Code 62-	Date SWRHL Received
Heart	X	AbC	Abomasum			
Kidney	L X R X		Content	183	40985	9 Feb. 196
Liver	X	AbT	Abomasum			
Lung	X		Tissue	142	40986	"
Muscle	X	BoF	*Bone, Femur	1800	40987	"
Spleen	X	BoH	**Bone, Hock			
Thyroid		Li	Liver	260	40988	"
		Lu	Lung(Tips)	134	40989	"
		Mu	Muscle	323	40990	"
		RuC	Rumen			
			Content	120	40991	"
		Th	Thyroid	86	40992	"

Other Tissue:

* Bovine ** Wildlife Ruminants

DATE HISTOPATHOLOGY TISSUES SHIPPED: CASE ACCESSION NO: CNG 136

SCIENTIFIC NAME: PHOTO NO:

AIP NO: AHU-29-NTS-68 OTHER NO: AHU-29

HISTORY:

Cow #29 was an 8 1/2-year-old registered Holstein cow, weighing approximately 1800 pounds. She was purchased from the Cantlon Farms on 15 Nov. 1964. She completed her fifth lactatio on 6 Feb. 1968. She produced 15,650 lbs. in 291 days. She was bred to #70 on 23 July 1967. She had been treated for mastitis on the 25th and 26th of January and responded well. She was transported to Well 3 on 6 Feb. No injuries were reported. She ate well and was apparently normal on the 6th and 7th. At 0700, 8 Feb. she was found (see attached sheet)

DATE OF DEATH: 8 Feb. 1968 HOUR: 1400 LOCATION: Well 3, NTS

DATE OF NECROPSY: 8 Feb. 1968 HOUR: 1510 LOCATION: Well 3, NTS

SEX: F AGE: 8 1/2 yrs. WEIGHT: 1800 lbs. ~~kg~~ METHOD: Scales

SPECIES: Bovine COMMON NAME: Cow BREED: Holstein

EXTERNAL APPEARANCE:

A mature Holstein cow in excellent condition. Rear quarters, limp, purple and cold. Slight mucoid discharge from vulva. Cow lying on her left side in corral. She is dragged into the Autopsy Room at 1510. There is an abraded area 3 cm in diameter anterior to the teat on the left rear quarter.

PRIMARY INCISION:

The cow is lying on her right side. A midline incision is made, and the left foreleg and le hind leg are reflected dorsally with the skin. Much yellow subcutaneous fat is present. The peritoneal cavity is incised, and the abdominal musculature is (see attached sheet)

APPENDIX VI. UNITED STATES PUBLIC HEALTH SERVICE
BIOENVIRONMENTAL RESEARCH PROGRAM
ROUTINE VETERINARY NECROPSY PROTOCOL

AIP NO: AHU-29-NTS-68

s for Histopathology:	Sample Code	Sample for Radioanalysis:	Wt. Gms.	SWRHL Code 62-	Date SWRHL Received
X	AbC	Abomasum			
L X R X		Content	183	40985	9 Feb. 1968
X	AbT	Abomasum			
X		Tissue	142	40986	"
X	BoF	*Bone, Femur	1800	40987	"
X	BoH	**Bone, Hock			
d	Li	Liver	260	40988	"
	Lu	Lung(Tips)	134	40989	"
	Mu	Muscle	323	40990	"
	RuC	Rumen			
		Content	120	40991	"
	Th	Thyroid	86	40992	"

Tissue:

* Bovine ** Wildlife Ruminants

ISTOPATHOLOGY TISSUES SHIPPED: CASE ACCESSION NO: CNG 136

IFIC NAME: PHOTO NO:

: AHU-29-NTS-68 OTHER NO: AHU-29

Y:

29 was an 8 1/2-year-old registered Holstein cow, weighing approximately 1800 pounds. s purchased from the Cantlon Farms on 15 Nov. 1964. She completed her fifth lactation eb. 1968. She produced 15,650 lbs. in 291 days. She was bred to #70 on 23 July 1967. d been treated for mastitis on the 25th and 26th of January and responded well. She ansported to Well 3 on 6 Feb. No injuries were reported. She ate well and was ntly normal on the 6th and 7th. At 0700, 8 Feb. she was found (see attached sheet)

F DEATH: 8 Feb. 1968 HOUR: 1400 LOCATION: Well 3, NTS

F NECROPSY: 8 Feb. 1968 HOUR: 1510 LOCATION: Well 3, NTS

F AGE: 8 1/2 yrs. WEIGHT: 1800 lbs. ~~kg~~ METHOD: Scales

S: Bovine COMMON NAME: Cow BREED: Holstein

AL APPEARANCE:

re Holstein cow in excellent condition. Rear quarters, limp, purple and cold. Slight discharge from vulva. Cow lying on her left side in corral. She is dragged into the y Room at 1510. There is an abraded area 3 cm in diameter anterior to the teat on the ear quarter.

2

INCISION:

w is lying on her right side. A midline incision is made, and the left foreleg and left eg are reflected dorsally with the skin. Much yellow subcutaneous fat is present. ritoneal cavity is incised, and the abdominal musculature is (see attached sheet)

Continuation Sheet
AHU-29-NTS-68

History:

down and did not arise until 0830 hours. Her temperature was 104.4°. Examination revealed that the ventral one-half of both rear quarters were cold and purple. She had a fetid diarrhea, was very uncomfortable, and seemed in pain. She was chomping her teeth and appeared very toxic. A diagnosis of gangrenous mastitis was made with a grave prognosis. Treatment began at 0930 hours--she was given 1,000 cc Polysol (Cutter) I. V., 500 cc Trisulfa (Am. Vet. Sup.) I. V., 10 cc Pyrahistine (Pitman-Moore) I. V., 20 cc A-H solution (Jen-Sal) Sub Q, 12 cc Iomycin (Norden) I. M., 5 cc Dihydrostreptomycin (Burns) I. M., 10 cc Dihydrostreptomycin (Burns) Intramammary (RR & LR), and 2 squeeze sets Valsengel (Eaton) (RR & LR). The cow steadily declined, and death occurred at 1400 hours.

Primary Incision:

reflected dorsally. The omentum contains much yellow fat. The ribs are cut at the costal chondral junction and at the spine. The rib cage is then removed.

DIGESTIVE SYSTEM: The rumen is full of bright green ingesta. It is very dry. The reticulum contains a magnet with a fine wire and iron filings adhered to it. No penetration is observed. The omasum is normal in appearance. The abomasum is filled with watery, fetid, greenish ingesta. The serosa is a dark red and shows a hemorrhagic enteritis. The intestines are gas filled and contain scanty amounts of yellow-greenish fetid fluid. The serosa is inflamed, and there are scattered areas of petechial hemorrhages throughout the length of the small and large intestines.

GENITO-URINARY SYSTEM: The uterus contains a normal female fetus of seven-month maturity. No lesions are observed in the kidneys or urinary bladder. The mammary gland, when incised, shows normal tissue and contents in the forequarters. The ventral one-half of the rear quarters is dark red, soft, pulpy, and has a putrid odor. Fluid contents are reddish white. The dorsal one-half of the rear quarters appears normal. There is a sharp line of demarcation between the gangrenous areas and the normal tissue.

RESPIRATORY SYSTEM:

The ventral tip of the left diaphragmatic lobe is emphysemic. All lobes of the right lung show hypostatic congestion. The right cardiac lobe is slightly adhered to the intermediate lobe. The bronchial lymph nodes appear normal.

CARDIOVASCULAR SYSTEM:

There is a slight adhesion between the diaphragm and the ventral tip of the pericardial sac. No evidence of pericarditis observed. The left auricle shows diffuse subepicardial hemorrhages at its borders. Petechial subepicardial hemorrhages are found at the tip of the left ventricle. As the left ventricle is incised, diffuse subendothelial hemorrhage is revealed. The entire endothelial lining has a hemorrhage approximately 1 mm in depth between it and the myocardium. All lymph nodes observed appear within normal limits.

MISCELLANEOUS: There are mucoid adhesions approximately 20 cm in diameter between the anterior lobe of the liver and the diaphragm and the reticulum. There are two small hernias in the diaphragm which are approximately 2 cm and 4 cm in diameter. These are located on the midline at the center of the diaphragm. A spherical mass of grossly normal liver tissue protrudes through each hernia. One mass is approximately 5 cm in diameter, and the other is 3 cm in diameter. Each mass is connected to the liver by normal appearing liver tissue which is approximately .5 cm in diameter.

ORGAN WEIGHTS AND MEASUREMENTS:

Lung wt: Not Taken gms

Left Apical	______ gms	Right Apical	______ gms
Left Cardiac	______ gms	Right Cardiac	______ gms
Left Diaphragmatic	______ gms	Right Diaphragmatic	______ gms
		Intermediate	______ gms

Thyroid wt: ________ gms (Before pathology sample taken)

Thyroid wt: ________ gms (After pathology sample taken)

COPIES TO: Dr. Engel
Farm
Dr. Smith

PROSECTOR: Dr. D. D. Smith

AIP NO: AHU-29-NTS-68

DATE OF NECROPSY: 8 Feb. 1968

HOUR: 1510

APPENDIX VII. Mastitis Incidence in Individual Cows

Cow No.	Jul-Sep 1966	Oct-Dec 1966	Jan-Mar 1967	Apr-Jun 1967	Jul-Sep 1967	Oct-Dec 1967	Jan-Mar 1968	Apr-Jun 1968	Jul-Sep 1968	Oct-Dec 1968
2		1-2 Nov R.F.,L.R.			21-22 Jul R.R.					
5	9-10 Jul L.R. 15-16 Aug L.R. 31 Aug L.R. 1-5 Sep L.R.	31 Oct All								
12			18 Mar R.R.							
15		17 Oct R.F. 14-15 Nov R.F.	24-25 Jan R.F.		15-25 Aug* Used as nurse cow 21-30 Sep		9-11 Jan All			
16								23-24 Apr R.R.		
18								28-31 May L.R.		

APPENDIX VII. Mastitis Incidence in Individual Cows (continued)

Cow No.	Jul-Sep 1966	Oct-Dec 1966	Jan-Mar 1967	Apr-Jun 1967	Jul-Sep 1967	Oct-Dec 1967	Jan-Mar 1968	Apr-Jun 1968	Jul-Sep 1968	Oct-Dec 1968
26							23-31 Mar L.R. Severe Injury			
28			14-27 Feb* L.F.					7-16 Jun**		
29				5 May L.F.			25-26 Jan R.F. 8 Feb L.R. Gangrenous mastitis Died 8 Feb			
36									21-31 Jul L.R.	
39					25-26 Jul R.R.					
43									8-10 Aug L.F.	
44	4-21 Sep* R.F.									

APPENDIX VII. Mastitis Incidence in Individual Cows (continued)

Cow No.	Jul-Sep 1966	Oct-Dec 1966	Jan-Mar 1967	Apr-Jun 1967	Jul-Sep 1967	Oct-Dec 1967	Jan-Mar 1968	Apr-Jun 1968	Jul-Sep 1968	Oct-Dec 1968
45				13-18 Jun R.F. 26 Jun R.F.	25 Jul R.F.	16-17 Oct R.F.				
46							24 Jan R.F.			
47				23-24 Jun L.R.,R.R.						
48		20-25 Nov R.F. 1-4 Dec L.F.								
83						15-17 Dec L.R.				
86			16-18 Mar L.R.			16-18 Dec L.R.,R.R.	9-11 Jan L.R.			
87							9-11 Jan All			

*Acute coliform mastitis
**Complications during calving

L.R. = left rear quarter
L.F. = left fore quarter
R.R. = right rear quarter

R.F. = right fore quarter
All = all quarters

APPENDIX VIII. UNITED STATES PUBLIC HEALTH SERVICE
BIOENVIRONMENTAL RESEARCH PROGRAM
SPECIAL VETERINARY NECROPSY PROTOCOL

AIP NO: AHU-5NTS 67

Tissues for Histopathology:		Sample Code	Sample for Radioanalysis		Wts. Gms.	SWRHL Code-62	Date SWRHL Received
Adrenal	L___ R___	AbC	Abomasum				
Aorta	___		Content	___	96	29334	___
Bronchial Lymph Node	___	AbT	Abomasum				
Colon	___		Tissue	X	94	29328	
Bone Marrow		Bl	Blood	___	781	29329	___
Eighth Rib	___	BoF	*Bone,Femur	___	___	___	___
Eye	X	BoH	**Bone,Hock	___	___	___	___
Heart	___	BoT	*Bone,Tail	___	___	___	___
Kidney	L 0 R 0	Ki	Kidney	___	___	___	___
Liver	0	Li	Liver	X	300	29330	___
Lung	X	Lu	Lung(Tips)	X	392	29331	___
Muscle	0	Mu	Muscle	X	351	29332	___
Ovaries	L___ R___	RuC	Rumen				
Rumino-reticular fold	___		Content	X	296	29333	___
Salivary Gland	___	SaG	Salivary				
Spinal Cord	___		Gland	___	___	___	___
Spleen	0	Sk	Skin	___	___	___	___
Testicles	L___ R___	Th	Thyroid	X	49	29335	___
Thyroid	X	Ur	Urine	___	___	___	___

Other Tissue: ___

*Bovine **Wildlife Ruminants

DATE HISTOPATHOLOGY TISSUES SHIPPED: ___ CASE ACCESSION NO: ___

SCIENTIFIC NAME: ___ PHOTO NO: ___

AIP NO: ___ OTHER NO: ___

HISTORY:

Cow #5 became sick in early March. On 6 March, the condition was diagnosed as traumatic reticulitis and intensive supportive treatment was begun. This consisted of antibiotic and sulfa therapy, rumen stimulants and rumen culture innoculations, elevation of front feet, etc. She aborted 24 March 1967. Despite this intensive treatment, she gradually declined until she died on the evening of 25 June. Antibiotic treatment was discontinued co

DATE OF DEATH: 25 June 1967 est HOUR: Late P.M. est. LOCATION: Well 3 corral

DATE OF NECROPSY: 26 June 1967 HOUR: 1140 LOCATION: Well 3 barn

SEX: F AGE: 8 yrs. WEIGHT: 400-450 kg METHOD: estimate

SPECIES: Bovine COMMON NAME: ___ BREED: Holstein

EXTERNAL APPEARANCE:

Cow is very emaciated. Weight is estimated at 850-900 lbs. Cow is lying on left side. There is a small amount of blood tinged fluid flowing from the nares. Rigor mortis is present in the rear extremities but is no longer present in the front extremities. The hair coat is very rough and hair is easily removed. No extensive tympanites is observed. There is edema of the submaxillary space, brisket and ventral portions of the neck. This condition had been observed several weeks prior to death.

PRIMARY INCISION:

Made on ventral midline. The skin and right front and rear legs are reflected dorsally. Clear fluid flows freely from the edematous areas of the brisket, submaxillary space and neck. The subcutaneous tissues in these areas are infiltrated with fluid from a depth of 1" to 3". The thyroid is excised and weighed. The right lobe feels fibrous. Edematous gelatinous tracts are found throught the musculature of the hind leg. This

APPENDIX VIII. UNITED STATES PUBLIC HEALTH SERVICE
BIOENVIRONMENTAL RESEARCH PROGRAM
SPECIAL VETERINARY NECROPSY PROTOCOL

AIP NO: AHU-5NTS 67

ues for Histopathology:		Sample Code	Sample for Radioanalysis		Wts. Gms.	SWRHL Code-62	Date SWRHL Received
nal	L ___ R ___	AbC	Abomasum				
a	___		Content	___	96	29334	___
chial Lymph Node	___	AbT	Abomasum				
n	___		Tissue	X	94	29328	___
Marrow		Bl	Blood	___	781	29329	___
Eighth Rib	___	BoF	*Bone,Femur	___	___	___	___
	X	BoH	**Bone,Hock	___	___	___	___
t	___	BoT	*Bone,Tail	___	___	___	___
ey	L 0 R 0	Ki	Kidney	___	___	___	___
r	0	Li	Liver	X	300	29330	___
	X	Lu	Lung(Tips)	X	392	29331	___
le	0	Mu	Muscle	X	351	29332	___
ies	L ___ R ___	RuC	Rumen				
no-reticular fold	___		Content	X	296	29333	___
vary Gland	___	SaG	Salivary				
al Cord	___		Gland	___	___	___	___
en	0	Sk	Skin	___	___	___	___
icles	L ___ R ___	Th	Thyroid	X	49	29335	___
oid	X	Ur	Urine	___	___	___	___

r Tissue: ___

*Bovine **Wildlife Ruminants

HISTOPATHOLOGY TISSUES SHIPPED: ___ CASE ACCESSION NO: ___

NTIFIC NAME: ___ PHOTO NO: ___

NO: ___ OTHER NO: ___

ORY:
ow #5 became sick in early March. On 6 March, the condition was diagnosed as traumatic iculitis and intensive supportive treatment was begun. This consisted of antibiotic sulfa therapy, rumen stimulants and rumen culture innoculations, elevation of front et, etc. She aborted 24 March 1967. Despite this intensive treatment, she gradually clined until she died on the evening of 25 June. Antibiotic treatment was discontinued

cont'd

OF DEATH: 25 June 1967 est HOUR: Late P.M. est. LOCATION: Well 3 corral

OF NECROPSY: 26 June 1967 HOUR: 1140 LOCATION: Well 3 barn

F AGE: 8 yrs. WEIGHT: 400-450 kg METHOD: estimate

IES: Bovine COMMON NAME: ___ BREED: Holstein

RNAL APPEARANCE:
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ARY INCISION:
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2

HISTORY: (Continued)

on 7 April 1967. When in good health she weighed 1300 lbs. Weight at death was estimated at 850-900 lbs.

PRIMARY INCISION (Continued)

musculature has a greenish cast and has a fetid odor indicating that death occurred several hours earlier. As the abdominal cavity is incised, clear blood tinged fluid escapes. It is estimated that the cavity contains at least 12 liters of this fluid.

DIGESTIVE SYSTEM:

The reticulum is adhered to the diaphragm. Rumen contains approximately one-half bushel of bright green ingesta. Search of reticulum revealed two magnets and two pieces of tie wire. This wire was very sharp but not penetrating at time of autopsy. Site of penetration could not be found. Omasum contains a scanty amount of green ingesta that was moist. Abomasum contains approximately 500 cc's of brown ingesta. Serosa of abomasum had started to slip. Intestines were filled with gas and contains scanty amounts of ingesta.

GENITO-URINARY SYSTEM:

Extensive postmortem changes in the kidneys - were very pulpy. No adhesions, abscesses or hemorrhages observed.
Uterus showed normal involution.

RESPIRATORY SYSTEM:

The ribs are cut with an axe at the vertebrae and at the costal-chrondral junction and removed. There are extensive adhesions between the rib cage and the right lungs.
Small abscesses containing a greyish white creamy exudate are intermingled with the adhesion
The lower three-fourths of all lobes of the right lung appear as a swollen grey sac. Imprin of the ribs may be seen in this mass. As the mass is incised, thin pinkish grey, very fetid exudate flows from it. Large masses of a creamy white, fibrinous, tenacious exudate is intermingled with the fluid. Total amount of exudate is estimated to be 18 liters. The walls of this huge abscess are approximately 3 cm in thickness and contain no recognizable lung tissue. The dorsal portion of the right lung and the left lung are compressed from this abscess and showed interlobular emphysema. Left lung shows hypostatic congestion. It XXXXXXXXXXXXXXXXXXXXXX estimated that the viable portion of the lung has been reduced by two-thirds or three-fourths.

CARDIOVASCULAR SYSTEM:

Pericardial sac was adhered to the diaphragm and to the rib cage. The pericardial sac was adhered very tightly to the heart and was pulled away with difficulty. Adhesions were fibrinous in nature and contained no abscesses. The heart was very flabby. Right ventricle and auricle were dilated. No valvular lesions were found. The spleen was swollen. When it was incised, bloody fluid flowed from it and left only the capsule. All parenchymatous XXXXXXXXXXXXXXX tissue shows advanced autolysis with only interstitial tissue.

MISCELLANEOUS:

Pictures were taken of all lesions. The carcass showed advanced postmortem changes so few histopathology samples were taken. A swab of the lung exudate was taken and sent to the laboratory for isolation and identification.

ORGAN WEIGHTS AND MEASUREMENTS:

Lung wt. Not taken gms

Left Apical	____ gms	Right Apical	____ gms
Left Cardiac	____ gms	Right Cardiac	____ gms
Left Diaphragmatic	____ gms	Right Diaphragmatic	____ gms
		Intermediate	____ gms

Thyroid wt: 50 gms (Before pathology sample taken)
Thyroid wt: 49 gms (After pathology sample taken)

COPIES TO: Farm Files (2)
Path. Lab

PROSECTOR: Dr. D. Smith
Assisted by: K. Giles
J. Titus

AIP NO: AHU-5

DATE OF NECROPSY: 26 June 1967

HOUR: 1140-133

VE SYSTEM:

culum is adhered to the diaphragm. Rumen contains approximately one-half bushel of
reen ingesta. Search of reticulum revealed two magnets and two pieces of tie wire.
e was very sharp but not penetrating at time of autopsy. Site of penetration could
ound. Omasum contains a scanty amount of green ingesta that was moist. Abomasum
approximately 500 cc's of brown ingesta. Serosa of abomasum had started to slip.
es were filled with gas and contains scanty amounts of ingesta.

URINARY SYSTEM:

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ges observed.
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TORY SYSTEM:

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There are extensive adhesions between the rib cage and the right lungs.
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flows from it. Large masses of a creamy white, fibrinous, tenacious exudate is
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sue. The dorsal portion of the right lung and the left lung are compressed from
cess and showed interlobular emphysema. Left lung shows hypostatic congestion. It is
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ds or three-fourths.

SCULAR SYSTEM:

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very tightly to the heart and was pulled away with difficulty. Adhesions were
s in nature and contained no abscesses. The heart was very flabby. Right ventricle
cle were dilated. No valvular lesions were found. The spleen was swollen. When it
sed, bloody fluid flowed from it and left only the capsule. All parenchymatous
XXXXXXX tissue shows advanced autolysis with only interstitial tissue.

EOUS:

were taken of all lesions. The carcass showed advanced postmortem changes so few
ology samples were taken. A swab of the lung exudate was taken and sent to the
y for isolation and identification.

IGHTS AND MEASUREMENTS:

Lung wt. Not taken ____gms

Left Apical	________gms	Right Apical	________gms
Left Cardiac	________gms	Right Cardiac	________gms
Left Diaphragmatic	________gms	Right Diaphragmatic	________gms
		Intermediate	________gms

Thyroid wt: 50 gms (Before pathology sample taken)
Thyroid wt: 49 gms (After pathology sample taken)

2

o: Farm Files (2)
Path. Lab

PROSECTOR: Dr. D. Smith
Assisted by: K. Giles
J. Titus

AHU-5

DATE OF NECROPSY: 26 June 1967 HOUR: 1140-1330

APPENDIX IX. List of Cows Arranged by Cow Number Showing Participation in Experiments

Cow No.	Rainout 29 Sep 66	Phoebus 23 Feb 67	SIP 6 Jun 67	MICE 22 Sep 67	Cabriolet 26 Jan 68
2	Control		Ingestion Hay	Ingestion Hay	
5	Control				
11	Control	Ingestion Hay	Ingestion Green Chop		Ingestion Hay Sta C3
12	Ingestion Hay	Ingestion Hay			Control
13	Ingestion	Inhalation		Control	Ingestion Hay Sta A3
15	Control				
16	Ingestion Hay		Ingestion Green Chop	Ingestion Green Chop	Control
17		Ingestion Hay	Ingestion Hay		
18	Ingestion Hay	Ingestion Hay	Ingestion Hay		Ingestion Hay Sta A3

APPENDIX IX. List of Cows Arranged by Cow Number Showing Participation in Experiments (continued)

Cow No.	Rainout 29 Sep 66	Phoebus 23 Feb 67	SIP 6 Jun 67	MICE 22 Sep 67	Cabriolet 26 Jan 68
19	Ingestion Green Chop	Ingestion Hay			Ingestion Hay Sta B2
21	Control	Inhalation		Ingestion Green Chop	Ingestion Hay Sta C5M
25		Inhalation			
26	Ingestion Green Chop				Ingestion Hay Sta C5M
27	Ingestion Hay	Ingestion Hay	Control	Ingestion Hay	Ingestion Hay Sta B2
28	Ingestion Hay	Ingestion Hay	Ingestion Hay	Ingestion Green Chop	
29			Control	Control	Control
35			Ingestion Green Chop	Ingestion Hay	
36			Ingestion Hay	Ingestion Green Chop	
39			Control	Control	

APPENDIX IX. List of Cows Arranged by Cow Number Showing Participation in Experiments (continued)

Cow No.	Rainout 29 Sep 66	Phoebus 23 Feb 67	SIP 6 Jun 67	MICE 22 Sep 67	Cabriolet 26 Jan 68
43	Ingestion Green Chop			Ingestion Hay	Ingestion Hay Sta C5M
44	Control			Control	Ingestion Hay Sta C3
45	Ingestion Green Chop		Ingestion Green Chop	Ingestion Green Chop	
46	Ingestion Green Chop	Ingestion Hay		Ingestion Green Chop	Ingestion Hay Sta C3
47	Ingestion Green Chop	Hay	Ingestion	Control	
48		Inhalation	Control		
83					Ingestion Hay Sta A3
84		Inhalation		Control	Ingestion Hay Sta A3
85		Ingestion Hay			Ingestion Hay Sta C5M

APPENDIX IX. List of Cows Arranged by Cow Number Showing Participation in Experiments (continued)

Cow No.	Rainout 29 Sep 66	Phoebus 23 Feb 67	SIP 6 Jun 67	MICE 22 Sep 67	Cabriolet 26 Jan 68
86		Ingestion Hay		Ingestion Hay	Ingestion Hay Sta C3
87		Inhalation	Ingestion Hay	Ingestion Hay	Ingestion Hay Sta B2

APPENDIX IX. List of Cows Arranged by Cow Number Showing Participation in Experiments (continued)

Cow No.	Buggy 12 Mar 68	Metabolism No. 1 7 May 68	Metabolism No. 2 13 Aug 68	HARE 18 Sep 68	Schooner 8 Dec 68
2	Control			Ingestion Alfalfa Green Chop	
11	Continuous Ingestion Hay Sta 2		^{131}I via capsule		Control
12	Control	^{131}I via capsule	^{131}I via capsule		
13	Continuous Ingestion Hay Sta 4			Ingestion	Ingestion Hay Sta 3
16				Ingestion Sudan Green Chop	Ingestion Hay Sta 10
18	Continuous Ingestion Hay Sta 4				
19	One Feeding Hay Sta 4				

APPENDIX IX. List of Cows Arranged by Cow Number Showing Participation in Experiments (continued)

Cow No.	Buggy 12 Mar 68	Metabolism No. 1 7 May 68	Metabolism No. 2 13 Aug 68	HARE 18 Sep 68	Schooner 8 Dec 68
21	One Feeding Hay Sta 2			Control	Control
26	One Feeding Hay Sta 2				
27	One Feeding Hay Sta 4			Control	Ingestion Hay Sta 11
35	Continuous Ingestion Hay Sta 4			Metabolism Study of Ingestion Alfalfa Green Chop	Ingestion Hay Sta 3
36				Metabolism Study of Ingestion Alfalfa Green Chop	Ingestion Hay Sta 11
39				Ingestion Alfalfa Green Chop	Ingestion Hay Sta 11

APPENDIX IX. List of Cows Arranged by Cow Number Showing Participation in Experiments (continued)

Cow No.	Buggy 12 Mar 68	Metabolism No. 1 7 May 68	Metabolism No. 2 13 Aug 68	HARE 18 Sep 68	Schooner 8 Dec 68
43	One Feeding Hay Sta 2			Control	Ingestion Hay Sta 11
44	Continuous Ingestion Hay Sta 2				Control
45				Ingestion Sudan Green Chop	Control
46	Continuous Ingestion Hay Sta 2			Control	Ingestion Hay Sta 11
47				Ingestion Sudan Green Chop	Ingestion Hay Sta 3
62				Metabolism Ingestion Alfalfa Green Chop	Ingestion Hay Sta 3
71	Control				
83	One Feeding Hay Sta 4				Control

APPENDIX IX. List of Cows Arranged by Cow Number Showing Participation in Experiments (continued)

Cow No.	Buggy 12 Mar 68	Metabolism No. 1 7 May 68	Metabolism No. 2 13 Aug 68	HARE 18 Sep 68	Schooner 8 Dec 68
84	Continuous Ingestion Hay Sta 4			Control	Ingestion Hay Sta 10
85	One Feeding Hay Sta 2			Control	
86	Continuous Ingestion Hay Sta 2				Ingestion Hay Sta 10
87	One Feeding Hay Sta 4		^{131}I via capsule	Control	

APPENDIX X. List of Cows Arranged According to Field Events and Type of Exposure

Name and Date of Experiment	Ingestion		Inhalation	Control	Remarks
	Hay	Green Chop			
Rainout 29 Sep 66 6 Oct 66	12,13,16 18,27,28	19,26,43 45,46,47 Alfalfa		2,5,11,15 21,44 Alfalfa green chop and hay	Final milk samples collected 29 Oct 66
Phoebus 23 Feb 67 28 Feb 67	11,12,17 18,19,27 28,46,83 85,86		13,21,25 48,84,87		Inhalation cows fed covered hay, however, reactor cloud missed Area 15 Farm. Composite samples collected through 28 Feb 67
SIP 6 Jun 67 16 Jun 67	2,17,18 36,47,87 One feeding of contaminated hay	11,16,28 35,83 Fed alfalfa green chop for 10 days	All cows in pens downwind of generator so all received an inhalation dose	12,25,27 29,39,48 Alfalfa green chop and hay	Calves 96,97,98,99 received milk from the green chop cows. Final milk samples collected 28 Jun 68
MICE 22 Sep 67 3 Oct 67	2,27,35 43,86,87 Fed loose hay a.m. of 22nd. Old baled hay from 22 Sep-24 Sep. Now baled hay fed 25 Sep-3 Oct	16,21,28 36,45,46 Fed alfalfa green chop 22 Sep-29 Sep	All cows in pens downwind of generator so all received an inhalation dose	13,29,39 44,47,84 Alfalfa green chop and hay	Final samples collected 13 Oct 67

APPENDIX X. List of Cows Arranged According to Field Events and Type of Exposure (continued)

Name and Date of Experiment	Ingestion		Inhalation	Control	Remarks
	Hay	Green Chop			
Cabriolet 26 Jan 68 4 Feb 68	13,18,71 84-Hay station A3 19,27.83 87-Hay station B2 11,44,46 86-Hay station C3 21,26,43 85-Hay station C5M			12,16,29 Hay	Final milk samples collected 6 Feb 68.
Buggy 12 Mar 68 21 Mar 68	13,18,35 84 fed hay 8 days from station 4 19,27,83 87-fed one feeding of hay Station 4 11,44,45 86 fed hay 8 days from station 2 21,26,43 85 fed one feeding of hay from station 2			2,12,71 Hay	Final milk samples collected 27 Mar 68.

APPENDIX X. List of Cows Arranged According to Field Events and Type of Exposure (continued)

Name and Date of Experiment	Ingestion		Inhalation	Control	Remarks
	Hay	Green Chop			
Metabolism Study No. 1 7 May 68					Cow 12 given ^{131}I via gelatin capsule - maintained metabolism stalls at Well 3. Final samples collected 10 May 68.
Metabolism Study No. 2 13 Aug 68					Cows 11, 12, and 87 given ^{131}I via gelatin capsule - maintained in metabolism stalls at Well 3. Final samples collected 16 Aug 68.
HARE 18 Sep 68 25 Sep 68		16,45,47 Sudan green chop 2,13,39 Alfalfa green chop 35,36,62 Alfalfa green chop and metabolism study at Well 3		21,27,48,84 85,86 Alfalfa green chop	

APPENDIX X. List of Cows Arranged According to Field Events and Type of Exposure (continued)

Name and Date of Experiment	Ingestion		Inhalation	Control	Remarks
	Hay	Green Chop			
Schooner 8 Dec 68 19 Dec 68	27,39,43 46 fed chopped hay from station 11 16,36,84,86 fed chopped hay from station 10 13,35,47,62 fed chopped hay station 3			11,21,44,45,83 fed baled hay	Feeding began a.m. of 9 Dec and concluded a.m. of 19 Dec. Last samples collected a.m. of 24 Dec.